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BERGER (G.). **Un nouveau parasite du Pois observé en Chaouïa (Maroc).** [A new parasite of Pea observed in Chaouïa (Morocco).]—*Rev. Path. vég.*, xxv, 4, pp. 239–243, 1 pl., 1938.

Peas growing in Chaouïa, French Morocco, are infected by a disease producing yellowish, diffuse spots on the stems, yellow to greyish, angular spots on both surfaces of the leaves, and occasionally yellowish, diffuse spots on the sides of the pods or along the whole length of the dorsal suture. The spots on the leaves are limited by the main veins or by a thin, brown margin; the affected leaves wither and dry up, while the petioles and tendrils, when attacked, turn uniformly yellow and shrivel. The affected areas are covered with the dark yellow to blackish fruiting bodies of the causal fungus. As a rule, infection starts in the basal parts and spreads progressively upwards, though occasionally isolated lesions occur on the leaves and stems. The fungus rarely progresses beyond the first pods, and no lesions are found on the very young parts of the plants. The disease is never fatal, but causes appreciable damage to young plants, which produce only a few small pods. Infection begins in November, in the new plantings, grows worse during the winter, and becomes general during flowering, in February and March. The disease is much more prevalent in humid than in dry localities.

The causal fungus is named *Cylindrosporium pisi* n.sp. [with a Latin diagnosis]. It is characterized by round or elliptical, depressed, light brown acervuli, 300 to 500 μ in diameter, with a brown or black margin, hyaline, continuous conidiophores, tapering at the apex, and measuring 8 to 14 by 3 to 4 μ, and hyaline, cylindrical, straight or slightly curved 1- to 2-, occasionally 3-septate conidia, rounded at the apex, and measuring 28 to 48 by 3 to 3·5 μ.

SMITH (F. L.) & HEWITT (W. B.). **Varietal susceptibility to common Bean mosaic and transmission through seed.**—*Bull. Calif. agric. Exp. Sta.* 621, 18 pp., 4 pl., 1938.

Seedlings of 118 bean [*Phaseolus vulgaris*] selections representing 51 varieties were inoculated in field plots by the carborundum leaf abrasion method with the mosaic virus [*R.A.M.*, xviii, p. 288 and next abstract] and the seed harvested therefrom planted at Berkeley and Davis, California. The percentage of seed transmitting mosaic for each selection is presented, the selections being arbitrarily classified in five categories according to the severity of the symptoms. To cite a few

examples, class 0 (plants with no symptoms) contained Great Northern (Idaho strains 1, 59, and 81) and Michigan Robust; representatives of class 1 (slight symptoms) included Bayo and Robusta; of class 2 (moderate symptoms) Kentucky Wonder, Red Kidney, Dark Red Kidney, and Cranberry; of class 3 (severe) Great Northern (three strains), Blue Pod, Mexican Red, two Stringless Green Pods (Burpee's and Refugee), and Large White; and of class 4 (very severe) Otenashi, Kotenashi, and Small White. The weighted averages of percentages of seedlings infected for all selections in the five classes were as follows: (0) Berkeley 0·0, Davis 1·7 per cent.; (1) 6·8 and 1·1, respectively; (2) 9·4 and 20·8; (3) 20·3 and 23·3; and (4) 36·1 and 30·4.

The correlation coefficients between mosaic category and percentage of seed-borne infection was 0·640±0·054 and 0·608±0·058 at Berkeley and Davis, respectively. These data are considered to indicate that the degree of severity of mosaic symptoms within the various classes, as here summarily defined, represents the relative susceptibility of the varieties tested and consequently may be used as a criterion of susceptibility to the disease. The generally more severe infection at Davis may be attributed to early aphid [*Macrosiphum pisi*] infestation. The mean daily temperatures at Berkeley during the growing season were from 61° to 62° F., the corresponding figures for Davis being 70° to 76°, but these differences were apparently not correlated with any divergence in the nature of the symptoms in the two localities.

From these results it is evident that in general varieties most severely affected with mosaic produce a higher percentage of infected seed than those less affected. Mosaic plants should be removed from the fields as soon as they can be recognized and growers saving their own seed should rogue as many times as necessary to eliminate infection before harvesting.

MOORE (W. D.). **Field studies of certain diseases of Snap Beans in the Southeast.**—*Tech. Bull. U.S. Dep. Agric.* 647, 28 pp., 4 figs., 1938.

The development of bean [*Phaseolus vulgaris*] dry root rot (*Fusarium martii phaseoli*) [*F. solani* var. *martii*: *R.A.M.*, xvi, p. 727] was studied on the Stringless Black Valentine and the Bountiful varieties of beans for four years at Charleston, South Carolina, under varied cultural practices. The infection was heavier on beans planted 2 in. deep than on those planted at 1 or ½ in., and tended to develop more in crops planted very early in the spring than in those planted at later dates. The various fertilizers used did not consistently affect dry root rot infection. Throughout the study seasonal conditions appeared to exercise a greater influence upon infection than most of the treatments tested. In these studies the degree of dry root rot development appeared to have no significant effect on yield.

Significant differences, varying from one season to another, were found between the 26 varieties of snap beans tested for susceptibility to mosaic [see preceding abstract], Hodson Wax and Red Valentine being more susceptible than most of the others, and for susceptibility to dry root rot, which ranged from 5·9 per cent. infection in Asgrow Stringless Valentine and Longfellow to 26·3 per cent. in Wardwell Kidney Wax. The wide differences in the yields of the varieties tested,

which also fluctuated from one season to another, were apparently not due to the degree of resistance to these two diseases but to some other varietal characteristics and to regional adaptations. The yield per plant of spring and autumn crops of Refugee 1000 to 1 beans infected with mosaic was only 77 and 50 per cent., respectively, of that from healthy plants, the corresponding figures for Early Refugee being 79 and 50 per cent. Mosaic-infected plants produced a reduced number of marketable pods per plant, and those produced were significantly shorter and lighter in weight than those from healthy plants.

Damping-off of beans in the south-east is most commonly due to *Pythium de Baryanum*. It is particularly destructive in the early spring, but plants which emerge normally may show damping-off of the lateral roots which retards development to a marked degree. None of the seed treatments tested had a significant effect on yield, but stands were slightly improved by ethyl mercury tartrate treatment and depressed by semesan [ibid., xvii, p. 503] seed treatment.

Yu (T. F.). **A blossom blight of Broad Bean (Vicia faba L.) caused by Botrytis cinerea Pers. under glass.**—*Lingnan Sci. J.*, xvii, 4, pp. 551–566, 3 pl., 3 graphs, 1938. [Chinese summary.]

In December, 1934, broad beans (*Vicia faba*) growing in a greenhouse in Nanking developed blossom blight caused by *Botrytis cinerea* [cf. *R.A.M.*, xvi, p. 723]. Minute, light yellow to brown, water-soaked spots appeared on the flowers, rapidly enlarged, and turned dark brown. Lesions were abundantly present on the petals of open flowers, which started to wither and finally became black and brittle. The fungus differed in culture from the strain reported on the same host from Spain [ibid., xi, p. 347] in its abundant production of white, later slightly green, finally shiny black, circular, elliptical, or irregular sclerotia; these measured 1 to 6 mm. in diameter on different media and were flattened or depressed on the upper surface and concave on the lower. The disease seldom occurred in well-ventilated houses. One application of Bordeaux mixture (4–4–50) when the flower buds open is recommended as giving complete control.

Henrick (J. O.). **Late blight of Celery (Septoria apii-graveolentis Dorogin).**—*Tasm. J. Agric.*, N.S., ix, 4, pp. 211–213, 1 fig., 1938.

During the past season, several celery beds in the vicinity of Launceston, Tasmania, were severely affected by the small-spot type of leaf spot due to *Septoria apii-graveolentis* [*R.A.M.*, xvii, p. 722]. Control consists in improved sanitary measures and crop rotation, seed treatment by dipping in mercuric chloride 1 in 1,000 (1 oz. in 6¼ gals. water) for 15 minutes, steeping in formalin solution (1 in 400) for 3 hours, or by immersion in hot water (118° F.) for 30 minutes, followed by cold rinsing, and protection of the growing crop by spraying with Bordeaux mixture (6–4–40). The plants should be sprayed when about 1 in. high, again a day or two before transplanting, and when 6 in. high, two further applications being made at intervals of 10 to 12 days. In subsequent seasons, attention to cultural hygiene and the use of clean seed should suffice to keep the beds healthy.

JAHNEL (H.). **Eine Spritzaktion zur Bekämpfung des Spargelrostes.** [A spraying campaign for the control of Asparagus rust.]—*Kranke Pflanze*, xv, 11, pp. 195–199, 1 graph, 1938.

Details are given of the organization and execution of a spraying campaign initiated in 1938 in the Lössnitz (near Dresden) district of Saxony against asparagus rust [*Puccinia asparagi*: *R.A.M.*, xvii, p. 581], which has been a source of such heavy losses to the local growers since 1931 as to necessitate special measures for its control. The application of 1 per cent. Bordeaux mixture at 8- to 10-day intervals commenced on 12th May and was continued until 25th June in eight localities covering a total area of 48·51 hect., using an average amount of mixture of 600 l. per hect. with a total consumption of 2,500 kg. at an inclusive cost of RM. 3,583.03. Apart from one or two exceptions, the treatment gave eminently satisfactory results and arrangements are to be made for its repetition in 1939.

FRON [G.] & BONNEMAISON. **Sur une maladie à virus du Céleri et du Concombre.** [On a virus disease of Celery and Cucumber.]—*C.R. Acad. Agric. Fr.*, xxiv, 26, pp. 897–904, 1938.

The senior author contributes a prefatory note to his ex-student's investigations on a disease resembling cucumber and celery mosaic [*R.A.M.*, xviii, p. 83], the cause of heavy losses to growers in the Lyons district of France, necessitating the virtual abandonment of the former crop and rendering the latter more or less unsaleable. Early in June a faint chlorosis and retardation of growth become apparent in celery seedlings sown in the open at the beginning of May. The outer leaves spread out and turn pale, the middle ones remain erect but are definitely smaller than those of healthy plants, while the central foliage is abnormally short and displays a mosaic of small, dark green and vivid yellow patches. The affected plants continue to grow during August and September, by which time the entire plot is infected. The inoculation of cucumber seedlings by rubbing the leaves with juice from infected celery plants resulted in delayed growth as compared with the controls after eleven days and in the development of chlorosis and other foliar abnormalities in 90 per cent. of the plants, 10 per cent. of which further showed a definite mosaic pattern of dark green and pale yellow. *Aphis gossypii* appears to be implicated in the transmission of the disease from celery to cucumber.

BÖNING (K.). **Phyllosticta-Fleckenkrankheit der Sojabohne.** [The *Phyllosticta* spot disease of the Soy-Bean.]—*Prakt. Bl. Pflanzenb.*, xvi, 7–8, pp. 168–172, 4 figs., 1938.

In a field of soy-beans near Straubing, Bavaria, *Phyllosticta sojaecola* [*R.A.M.*, xi, p. 88] was observed causing a spotting of the leaves and often of the stems and fruits. On the leaves the spots were round or oval, 1 to 15 mm. in diameter, and dark to olive brown with a characteristic darker margin. The stems showed brown stripes about 20 mm. long. The spots on the pods were mostly round, brown with a reddish margin, and 1 to 5 mm. in diameter. Numerous brown, spherical pycnidia were embedded in the affected tissue, those on the leaves measuring 50 to 120 μ and those on the fruit up to 180 μ in diameter;

the spores averaged 5 to 6 by 3 μ. In pure culture the fungus developed a rapidly blackening, submerged mycelium and a dense, fluffy aerial mycelium bearing numerous microsclerotia. Sometimes larger sclerotia were also formed. The higher fruiting form of the fungus, *Pleosphaerulina sojaecola* [loc. cit.], was not observed. Infection is seed-borne, and seed disinfection together with the destruction of diseased plants and harvest debris are recommended for the control of the disease.

BOSE (R. D.). **The rotation of Tobacco for the prevention of wilt disease in Pigeon-Peas [Cajanus cajan (Linn.) Millsp.]**—*Agric. Live-Stk India*, viii, 6, pp. 653–668, 2 diags., 4 graphs, 1938.

Evidence had already been obtained in experiments at Pusa in 1933–4 that the incidence of pigeon pea (*Cajanus cajan*) wilt (*Fusarium vasinfectum*) [*R.A.M.*, xvii, p. 652] may be minimized by growing the crop in succession to tobacco, and further trials are stated to have fully substantiated the previous results.

In 1934–5 observations were initiated on a set of four lysimeters filled with alluvial soil from a tobacco field and another set containing similar soil from an adjacent linseed field, all of which were inoculated annually until 1936–7 with spore material of the fungus and sown with the highly susceptible Pusa pigeon pea Type 5, weekly counts of the mortality from wilt being made from the fourth week onwards. The disease was very severe in all the lysimeters, the mortality in the tobacco and linseed series being, respectively, 99·5 and 100 per cent. in 1934–5, 100 and 100 per cent. in 1935–6, and 91·5 and 98·5 in 1936–7, but the time taken by the plants to die was found to be significantly longer in the tobacco than in the linseed soil (5·67 as compared with 4·77 months in 1934–5, the corresponding figures for 1935–6 and 1936–7 being 3·25 and 2·79 and 3·93 and 3·37, respectively). The plants in the tobacco series were also more vigorous than those in the linseed soil, judged by the average diameter of the stems (1935) (6·67$\pm$0·28 as against 5·7$\pm$0·22 mm.).

The results of the foregoing tests were strikingly confirmed by a field experiment in 1936–7, which showed that the growth of *F. vasinfectum* is retarded by rotation with tobacco, thus enabling the pigeon pea to escape infection to a considerable extent, particularly at an early age. The total percentage of wilted plants in the artificially infected tobacco plot was only 70·05 compared with 95·29 in infected fallow soil, the average time taken by plants to die being 6·71 and 5·74 months in the two plots, respectively, the corresponding figures for plots not artificially infected being 34·6, 78·08, 7·86, and 6·55. These differences are considered to be statistically significant. It is surmised that the adverse effect of the tobacco crop on the wilt fungus is due to the presence of stumps and buried roots in the soil.

For control purposes in addition to the use of wilt-resistant pigeon peas, Types 80 and 82, the writer advocates the interposition of a tobacco crop every three or four years, especially in districts where the disease is very severe, such as parts of North Bihar. In low-lying areas it may be sufficient to bury tobacco stems in the soil a month or more before sowing the pigeon pea crop.

BRANAS (J.). **Le court-noué en Afrique française du Nord.** [Court-noué in French North Africa.]—*Progr. agric. vitic.*, cx, 44, pp. 373–379, 1938.

The author considers that the recently established introduction of *Phylloxera* [*vastatrix* f. *radicicola*: *R.A.M.*, xvii, p. 793] into Algeria and Tunis is very likely to contribute to a more or less rapid spread in those colonies of court-noué of the vine [ibid., xviii, p. 86]. He again stresses the necessity of carefully eradicating all court-noué stocks, especially in *Phylloxera*-infested areas, after which the soil should be rested or grown to non-susceptible crops for some years. The chief precaution, however, when making new or reconstituting old vineyards, should be to ensure the complete freedom of all planting material from disease.

STELLWAAG (F.) & BRANAS (J.). **Chronique. Des phénomènes de dégénérescence de la Vigne. Sur le 333 E.M. (Foëx.)** [Current notes. Some phenomena of Vine degenerescence. On 333 E.M. (Foëx).]—*Progr. agric. vitic.*, cx, 46, pp. 413–417, 1938.

In the part of this paper dealing with degeneration diseases of the vine in Germany, F. Stellwaag states that court-noué [see preceding abstract] or 'reisigkrankheit' is very prevalent in the region of the Ahr [*R.A.M.*, xiii, p. 213]. The diagnostic symptom is the presence of intracellular cordons. The author considers that much of the available information points to the disease being of virus origin. Leaf roll or 'rollerkrankheit' is a different kind of degeneration phenomenon, in which the leaves roll over towards the base, develop an autumn colouring prematurely, and show abnormal susceptibility to environmental factors. The fruit bunches are wanting in density, and the yield is unreliable. Transmission can occur through grafting and this disease also is regarded as of virus origin. Precocious senility or 'überaltern' is a growth phenomenon unassociated with any virus, although the symptoms include witches' broom formations, shortened internodes, and change of shape of the leaves. Intracellular cordons are absent. In eastern Germany, a trouble (referred to as 'kräutern') occurs which shows itself in the branching and over-abundance of the foliage. The internodes are shortened, but not in the same way as in court-noué. The leaves often fail to reach a normal size, though their shape is normal. The cells do not as a rule show the presence of intracellular cordons, and, so far as is known at present, the condition is not due to a virus. In most cases the trouble follows frost, or a lack of affinity in grafted vines, or some nutritional deficiency. 'Markkrankheit' or pith disease [*Pumilus medullae*: ibid., xvii, p. 793] is rare in Germany itself, but has been noted on Austrian vines and young grafted vines.

In the opinion of Branas, precocious senility ('überaltern') may possibly correspond to the slow form of apoplexy observed in damp localities [ibid., xvii, p. 372], while 'kräutern' is the form of court-noué due to frost; 'rollerkrankheit' would appear to resemble flavescence [= 'rougeau' of red vines: ibid., xii, p. 675], and may be a transmissible form of the condition. Branas further states that neither 333 E.M. nor any other varieties are known to be resistant to court-noué, since

in all cases (except, perhaps, *Vitis rotundifolia*) the roots are infested by *Phylloxera* [*vastatrix* f. *radicicola*: ibid., xvii, p. 653].

MARCHIONATTO (J. B.). **Contribución al conocimiento del 'Botrytis cinerea' en la Republica Argentina.** [A contribution to the knowledge of *Botrytis cinerea* in the Argentine Republic.]—*Jornadas agrón. vet., B. Aires, 1937*, pp. 179–195, 2 pl. (1 col.), 7 figs., 1938.

Botrytis cinerea occurs in the Argentine as a parasite on vines, carnations, oranges [*R.A.M.*, x, p. 24], strawberries, roses, and dahlias. The writer's studies have been mainly concerned with the effects of the fungus on White Muscatel grapes [ibid., xvii, pp. 293, 499, *et passim*] and Henri IV roses [ibid., xvii, pp. 248, 682], the symptoms of the disease on which, the mode of infection, the life-history of the causal organism, and measures for its control are concisely described.

WARE (W. M.) & GLASSCOCK (H. H.). **Department of Mycology.**—*J.S.-E. agric. Coll., Wye*, xliii, pp. 15–23, 1939.

In this report [cf. *R.A.M.*, xvii, p. 373] it is stated that dwarfed oats received at Wye showed the presence of *Dictyosporium opacum* [ibid., x, p. 446] on pale lesions with brown margins on the lowest internode. Tick beans [*Vicia faba*] affected by chocolate spot (*Botrytis cinerea*) [cf. ibid., xvii, pp. 646, 787] showed only very few discoloured areas on the stem, on which the attack took the unusual form of deep lesions or cankers, generally at a leaf scar, and present from ground-level to a height of 18 in. The lesions were ¾ to 3 in. in length and covered with the conidiophores of the fungus. Frequently the stem was broken and the crop appeared to be in a very sickly condition. There was some evidence of the presence of *Sclerotinia sclerotiorum*, possibly as the primary pathogen.

A brown stipple-spotting of the leaves of Eclipse potatoes was due to manganese deficiency [ibid., xvi, p. 269]. Potentate tomatoes near Hythe were seriously affected by mixed-virus streak [ibid., xvi, p. 842]. On the vegetative parts of the tomato plant single and mixed-virus streak cannot be distinguished without a test, but on the epidermis of the fruit the former produces sunken and the latter raised brown marks. A quince tree at Haywards Heath showed the presence of *Podosphaera leucotricha* on the upper and lower leaf surfaces; about one half of the fruits were also reported to be affected.

In a 15-year-old hop garden (Tutsham variety) near Faversham twenty-seven hills in a group interspersed with some healthy ones showed symptoms somewhat resembling infectious sterility [ibid., xv, pp. 395, 605]; the bines and laterals were normal, but the cones were few and small, averaging ½ in. in length. The foliage was in some cases darker than normal. Sudden death of the growing point of the main bine was not observed. Fluffy tip [ibid., xvi, p. 367] was not seen in 1938.

Pseudobalsamia microspora [ibid., xvii, p. 379] was found in a mushroom [*Psalliota* spp.] house near Maidstone and in London. *Geomyces auratus* and *Trichoderma viride* [ibid., xiv, p. 366] were found in mushroom compost.

HUNGERFORD (C. W.). **Plant pathology.**—*Rep. Idaho agric. Exp. Sta., 1937* (*Bull.* 225), pp. 55–59, 1938.

In further work on the development of bean [*Phaseolus vulgaris*] varieties resistant to curly top and mosaic in Idaho [*R.A.M.*, xvi, p. 22; xviii, pp. 150, 290] many selections of Great Northern beans showed complete resistance to both diseases. The mosaic-resistant Great Northern beans U.I. 59, U.I. 81, and U.I. 123 now constitute locally almost the whole planting of commercial Great Northern beans. Eight growers who received seed of the new Norida bean in 1937 reported that it was earlier maturing than their own crops and completely free from bean mosaic.

Physiologic race 19 of cereal stripe [yellow] rust [*Puccinia glumarum*] predominates in Idaho.

The vacuum method of inoculating barley seed with chlamydospores of *Ustilago hordei* gave up to 82 per cent. infection [cf. ibid., xviii, p. 172], Tapke's method giving the next best results, with 70 per cent. infection [cf. ibid., xvi, p. 375]. Inter- and intraspecific monosporidial crosses between *U. hordei* and *U. nigra* [ibid., xviii, p. 308] showed that segregation for sex may occur in the first or second reduction division. Hybridization takes place readily, with the production of echinulate chlamydospores in the F_1 generation, in which smutted heads resembling both parents were obtained.

PALUCH (J.). **Doświadczenia nad zjadliwością różnych szczepów Pseudomonas tumefaciens i Phytomonas rhizogenes dla Pelargonij oraz nad wpływem niektórych enzymów trawiących na nowotwóry otrzymane doświadzalnie.** [Experiments on the virulence of some strains of *Pseudomonas tumefaciens* and *Phytomonas rhizogenes* on Pelargonium, and on the influence of some digestive ferments on experimental crown gall.]—*Acta Soc. Bot. Polon.*, xv, 1, pp. 37–46, 1 pl. [following p. 60], 1938. [English summary.]

When strains of *Pseudomonas* [*Bacterium*] *tumefaciens* and *Phytomonas* [*Bact.*] *rhizogenes* were inoculated into wounded stems of very young *Pelargonium* plants some considerable distance above soil-level, positive results were obtained only with the 'Bela' strain of *Bact. tumefaciens*, obtained from the Lister Institute, London [cf. *R.A.M.*, xviii, p. 160].

In repetition of the experiments of P. A. Ark [ibid., xvi, p. 590] 11 galls on *Pelargonium* plants that had been inoculated with *Bact. tumefaciens* ('Bela' strain) were treated with papain and an equal number with pepsin, eight remaining untreated as controls. The enzymes were applied as a powder, placed in incisions where small sections of the galls had been cut away. Similar sections were cut from all the control tumours, and all the wounds were wrapped in cellophane. Six of the pepsin-treated galls deteriorated one month after treatment, while five showed only very slight injury or none at all. Of the papain-treated galls, three died, while the others remained partly or wholly intact. Of the controls, four died in the same way as the treated ones. These results indicate that papain and pepsin are not always effective in the treatment of crown gall, necrosis of which may be induced by mechanical injury.

SPRAGUE (R.). **The status of Septoria graminum.**—*Mycologia*, XXX, 6, pp. 672–678, 5 figs., 1938.

From a review of the relevant literature and the critical examination of herbarium material, the author considers that the widespread concept of *Septoria graminum*, based on Saccardo's description, is an unjustifiable grouping of at least three distinct species, namely, *S. graminum* proper, *S. calamagrostidis*, and *S. tritici* [cf. *R.A.M.*, xiii, p. 434]. To judge from the type specimen of *S. graminum* on *Brachypodium sylvaticum* and from the apparently more mature material collected by Saccardo and Vestergren, this species occurs on *Brachypodium* spp. in Europe, and has medium-sized hyaline, aseptate to faintly uni- or sometimes bi-septate, very uniformly narrow, and somewhat curved pycnospores, 15 to 55 (but mostly 24 to 45) by 0·8 to 1·5 μ. Studies in progress in Oregon and Washington with a number of species of this genus on 20 genera of Gramineae, including 58 species of naturally infected grasses and cereals, indicate that *S. graminum* is not a plurivorous species. *S. calamagrostidis* occurs on *Agrostis palustris* in Oregon whilst the filiform species on wheat is *S. tritici*. The diagnostic characters of species of *Septoria* parasitizing Gramineae are summarized in an appended table, and a revised English description of *S. graminum* is also given.

SOUKHOV [SOUKHOFF] (K. S.) & VOVK (A. M.). **Mosaic of cultivated cereals and how it is communicated in nature.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., XX, 9, pp. 745–748, 2 figs., 1938.

Further experiments on the mosaic disease of oats substantiated the earlier evidence as to the virus nature of this disease [*R.A.M.*, xvii, p. 668]. When oats were grown under gauze to protect them from insects no signs of disease appeared on the plants, but when small holes were made in the gauze to allow the tips of seedlings to pass through, 8·5 per cent. of the cages were found to contain diseased plants, proving that insects were responsible for transmitting the disease. In transmission experiments with various insects positive results (67·1 per cent.) were obtained with *Delphax striatella* (sexually mature males and females and larvae) after an incubation period of 7 to 9 days. By means of this insect the disease was successfully transmitted from oats to barley and millet [*Panicum miliaceum*] and from barley to oats. Mosaic was further detected in rye and maize, and wheat is also apparently liable to infection, as well as *Calamagrostis epigeios*, although this plant seems to be generally very resistant to mosaic. In cytological studies the presence of aciculate crystals was detected in the cells of mosaic-diseased plants, and new forms of giant crystals in the shape of rings, eights, and twisted braids, were observed in the epidermal cells and guard cells of the stomata, whereas they were never found in the cells of healthy plants. In their dimensions and shape these giant crystals resemble the protein crystals of the Cactaceae and their protein nature is indicated by microchemical tests. They sometimes break up into small, aciculate crystals. Similar giant crystals have also been found in mosaic-infected millet, barley, and maize, and they are believed to be the virus itself.

EKSTRAND (H.). **Några ekonomiskt viktiga sjukdomar på höstsäd och vallväxter.** [Some economically important diseases of autumn-sown grain and grasses.]—*Medd. Växtskyddsanst., Stockh.*, 25, 23 pp., 6 figs., 1938. [German summary.]

The snow mould (*Fusarium minimum*) [*Calonectria graminicola*] is stated to be the chief agent of damage to autumn-sown cereals, especially rye, in Sweden [*R.A.M.*, xiv, p. 21], some 230 samples examined in 1938 from all parts of the country having been contaminated by the fungus, which was also prevalent on meadow grasses, turf, and natural greens. Infection probably takes place to a considerable extent through the soil.

Further information is presented concerning the relation of *Typhula itoana* (considered to be the correct name for *T. graminum*) [ibid., xvi, p. 802; xvii, p. 230; xviii, p. 34] to winter injury of cereals and grasses. In 1936 the yield of a wheat crop in Dalarna was reduced by 75 to 80 per cent. by the attack of the fungus, fallen birch leaves bearing the sclerotia of which were scattered in profusion through the field. Next year timothy [*Phleum pratense*] on the same site was slightly infected and birch leaves with sclerotia were again observed on the ground both in 1937 and 1938; in the latter year the bulk of the damage on timothy was caused by another species of *T.*, which was also responsible for severe injury to wheat and rye in the previous winter. In the spring of 1938 the sclerotia of *T. itoana* were detected in another locality on fallen birch leaves in an infected wheat field. In an experiment, beech leaves which had fallen into inoculated pots bore sclerotia of the fungus in the following spring. In cross-inoculation tests, in which sterilized and unsterilized fallen birch leaves, dried and living rye and wheat leaves, and *Stellaria media* leaves were infected by *T. itoana* from different sources, positive results were obtained in every case, showing that the organism is capable of persisting as a pure saprophyte in a given area even where crop rotation is practised.

Like *C. graminicola*, *T. itoana* flourishes under a heavy snow-cover at slightly above a temperature range of 0° to 5° C. In comparative varietal observations on rye at the Luleå branch of the Swedish Association it was noted that southern selections were most severely injured by fungi of the *T.* group, while those of northern origin suffered either predominantly from the snow mould or from both sources equally. In a rye experiment in 1938, a *T.* sp. with small, black sclerotia was much more prevalent than *T. itoana*; outstanding resistance was shown by two varieties, one of which remained entirely healthy, while the other bore only traces of *T. itoana* and was free from the other *T.* sp. and *C. graminicola*.

The hosts of *Sclerotinia borealis* in northern Sweden include timothy, rye grass [*Lolium perenne*: ibid., xvi, p. 802], rye, wheat, *Poa annua*, *P. pratensis*, *P. serotina*, *Agrostis vulgaris*, and *Festuca rubra*. Generally speaking, grasses of southern origin are more susceptible to infection than the indigenous northern strains. Nilsson and Naesman observed, for instance, in 1937 (*Svensk Utsädesfören. Tidskr.*, xlvii, p. 20) that Bothnia timothy at Luleå showed a high degree of resistance to the fungus.

Briefly discussing winter-hardiness in cereals and grasses, the writer

thinks that, under Swedish conditions, the condition is practically synonymous with resistance to parasitic infection. The heaviest losses, as indicated above, are liable to occur during relatively mild winters in which the unfrozen ground is covered with a thick layer of snow.

In 1936 fruit bodies of *Mitrula sclerotiorum* [ibid., xv, p. 725] were observed to emerge from the sclerotia of *S. trifoliorum* [ibid., xvii, pp. 252, 699, 825], the principal agent of winter injury to clover, and in 1937 the former fungus was again recorded from various localities. In the writer's opinion, *M. sclerotiorum* is not a parasite of clover but of *S. trifoliorum*. *T. trifolii* [ibid., xv, p. 388] was also detected in 1937 on dead clover plants from about 15 localities. Both *S. trifoliorum* and *T. trifolii* have been found in clover seed, being capable of attacking the upper parts of the plants in hot weather. *S. trifoliorum* is pathogenic to first-year clover as well as to older crops, and also occurs on blue lupins [*Lupinus angustifolius*] and black or hop medick [*Medicago lupulina*].

Humphrey (H. B.), Johnston (C. O.), Caldwell (R. M.), & Compton (L. E.). **Revised register of physiologic races of leaf rust of Wheat (Puccinia triticina).**—18 pp., U.S. Dep. Agric. Bur. Pl. Ind., Div. Cereal Crops and Dis., 1939. [Mimeographed.]

This is a revision of the list of physiologic races of wheat leaf rust (*Puccinia triticina*) published by the first three authors in 1936 [*R.A.M.*, xvi, p. 732], bringing the number of recognized races up to 108. An analytical key is given to assist in the identification of the different races. No attempt has been made in the list to eliminate anything except obvious duplications. The three physiologic races isolated by Hassebrauk in Germany and designated A, B, and C [ibid., xvii, p. 226] are numbered 92, 93, and 94, respectively. Of the six new races numbered 64 to 69 by Ilme Rashevskaya and Barmenkoff [ibid., xvi, p. 163], the first appears to be a mixture of race 77 and some other race, and is omitted, while race 65 is identical with 31, and 66 with 77. The Russian workers' races 67 and 68 appear to be valid, and are retained under the numbers 98 and 99, respectively. Their race 69 is, however, doubtful, and probably cannot be separated from 99; it is, therefore, omitted. The Australian wheat variety, Thew, is now included in the list of differential host varieties. Race 26, originally described by W. L. Waterhouse as Aust. 2 [ibid., xi, p. 629], readily attacks Thew, while race 95 is identical with 26 except that it cannot fruit on Thew (type 0). Races 96 and 97, described by Waterhouse as A and B [loc. cit.], respectively, are almost identical with race 68.

Gassner (G.) & Franke (W.). **Untersuchungen über den Stickstoffhaushalt rostinfizierter Getreideblätter. Ein Beitrag zum Problem der Teleutosporenbildung.** [Studies on the nitrogen economy of rust-infected cereal leaves. A contribution to the problem of teleutospore production.]—*Phytopath. Z.*, xi, 5, pp. 517–570, 12 graphs, 1938.

The object of the experiments herein fully described and tabulated

was to determine the influence of the brown and yellow wheat rusts (*Puccinia triticina* race 14 and *P. glumarum* races 1, 5, 6, 7, 9, 18, and 19) on the nitrogen economy of infected leaves [cf. *R.A.M.*, xiii, p. 755], and the relationship of the latter condition to teleutospore production by the pathogens.

In inoculation tests, leaves of varieties giving an immune or semi-immune reaction underwent little or no modification of the nitrogen content, but in the case of moderately severe to heavy infection there was a marked tendency in the diseased leaves to retain the assimilated nitrogen much longer than healthy ones; in extreme instances the normal abrupt fall after the attainment of the maximum did not occur at all, and by the end of the trials the nitrogen content of the diseased foliage was generally higher than that of the sound leaves. Similar but less pronounced changes followed inoculations giving rise to slight infection. The results obtained with both rusts were of the same order, but *P. triticina* seemed to exert a stronger influence than *P. glumarum* on the nitrogen content of diseased plants.

These observations necessitate a complete change of outlook as regards the nature and origin of teleutospore production. The view of this process as a reaction of the rust to exhaustion of the host is no longer tenable, since externally wilted leaves contain a plentiful supply of nitrogen, which evidently plays an essential part in the development of the organs. The immediate stimulus to teleutospore formation is given by the gradual loss of water from the rusted leaves, which also involves the invading mycelium and is accompanied by a significant increase of nitrogen. Some light is further thrown by these data on the conditions governing the development of the uredo stage of the rusts, which must necessarily be opposed to those favouring teleutospore production and entail a high degree of atmospheric humidity.

Straib (W.). **Über den Einfluss der Steinbrandinfektion auf das Gelbrostverhalten des Weizens.** [Concerning the influence of bunt infection on the reaction of Wheat to yellow rust.]—*Phytopath. Z.*, xi, 6, pp. 571–587, 1 fig., 1938.

In a study on the reaction of wheat infected with bunt (*Tilletia tritici*) [*T. caries*] to yellow rust (*Puccinia glumarum*), increased susceptibility to yellow rust following inoculation with *T. caries* was observed almost exclusively on wheat varieties of 'labile' [= unstable] summer resistance [*R.A.M.*, xiii, p. 756] in the later stages of development of the plant (from the beginning of earing and especially after flowering), whereas no influence was perceptible in seedlings or young plants or in immune wheat varieties, and little or none in wheats of 'stable' summer resistance. Susceptible wheat varieties were not rendered still more susceptible by bunt infection. The enhanced susceptibility to yellow rust of bunted wheat varieties showing labile summer resistance varied considerably in different years and in different varieties. It is concluded that the use of bunt-infected wheats for testing their reaction to yellow rust in breeding work may be of some value for varieties showing labile summer resistance, but that it does not generally appreciably facilitate the work of selecting resistant varieties.

MARTIN (J. F.). **Effect of seed disinfection and delayed sowing on the control of bunt in infested soil.**—*J. Amer. Soc. Agron.*, xxx, 10, pp. 870–877, 1938.

In four years' tests on bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] control in wheat (Hybrid 128) sown in artificially infected soil in Oregon, new improved ceresan was superior to the other disinfectants used [*R.A.M.*, xvii, p. 666]. Applied at the rate of 3 oz. per bush., it reduced infection by 66·3 and 74·8 per cent. in 1933–4 and 1934–5, respectively, as compared with 100 per cent. infection in the controls. At this concentration, however, a considerable reduction in stand was liable to result from the treatment. The ½ and 1 oz. rates of application decreased the incidence of bunt by 47·5 and 52·3 per cent., respectively. Treatment three weeks before sowing caused no consistent loss of efficacy.

When sowing was not delayed more than 24 hours, ethyl mercury iodide was about equal to new improved ceresan, reducing infection on an average by 47·7 per cent. in 1936 at ½ oz. per bush., but a distinct decline in efficacy was observed when ten days elapsed between the treatment and sowing.

Copper carbonate and copper sulphate were equally effective in combating soil-borne infection [ibid., xviii, p. 14], while the former reduced the amount of bunt in the crop by 22·3 to 31·5 per cent. during the four years of the trials (4 oz. per bush. in the first two years and 3 oz. in the last).

In 1933–4 formaldehyde (1 in 384) gave as good control of bunt as the two copper dusts in 1933–4, but these results were not substantiated during the next two seasons, when only 4·4 and 10·3 per cent. reduction were obtained.

Percentages of bunt were significantly lower when the wheat was sown the day the soil was inoculated and watered than when a week or ten days were allowed to elapse before sowing [presumably owing to the inhibiting effect on the germination of bunt spores of saturated soil] Under the conditions of the experiments, a period of 50 to 60 days between soil inoculation and sowing was usually required before sufficient spores were destroyed to eliminate the risk of disease from heavy infection, though low temperatures occasionally operated to prevent this development. Low infection percentages were obtained in untreated controls sown 60 days or more after the inoculation of the soil with bunt spores. The seasonal trend of infection was very similar in treated and untreated material. This evidence indicates the delay in sowing, after the beginning of favourable moisture conditions in the autumn, necessary to reduce infection to the minimum.

GASSNER (G.). **Ueber Partialinfektionen von Weizenkörnern durch Tilletia und die Entstehung der Steinbrandbutten.** [On partial infections of Wheat grains by *Tilletia* and the development of bunt balls.]—*Phytopath. Z.*, xi, 5, pp. 451–467, 7 figs., 1938.

The Turkish 218/19 wheat harvest of 1935 yielded a high proportion of semi-bunted grains, representing every phase of infection by *Tilletia foetens* from the slightest degree of involvement to complete bunt balls,

and affording an opportunity to trace the various steps in the development of the latter.

In every case the spores emerged from the inner layers of the pericarp. Invasion of the ovule could not be demonstrated and is evidently precluded by the suberized seed coat. The ovule perishes, however, either through mechanical displacement by the bunt balls arising in the inner pericarp layers, or through the prevention of normal fertilization, but in no case, as hitherto surmised, by actual infection of the organ itself. The semi-bunted grains of wild wheats, with their germinable but heavily infected seeds basally enveloped by spores, may well play an important part in the uniform distribution of both host and parasite. Field experiments with semi-bunted grains showed that the spores surrounding the embryo were capable of infecting the emerging seedling to the extent of 8·7 per cent.

Semi-bunted grains cannot be eliminated from the harvest either by mechanical means or by washing or immersion, but in a test on 150 selected grains partial infection was reduced from 8·7 to 0 per cent. by half-an-hour's immersion in 0·15 per cent. germisan or dusting with ceresan.

Further observations in the summer of 1937 fully confirmed the previous year's conclusions as to the exclusive origin of the bunt balls in the pericarp. The copious formation of chlorophyll in the pericarp layers of bunted grains points to a modification in the normal metabolic processes in the direction of increased nitrogen assimilation, a fact to be remembered in attempts to interpret the well-known phenomenon of the enhanced susceptibility to rusts [*Puccinia* spp.: see above, p. 300] of bunted plants.

Gassner (G.). **Ueber Auftreten und Verbreitung von Tilletia tritici und Tilletia foetens in der Türkei.** [On the occurrence and distribution of *Tilletia tritici* and *Tilletia foetens* in Turkey.]—*Phytopath. Z.*, xi, 5, pp. 469–488, 1 fig., 1 map, 1938.

Out of 2,272 bunted wheat ears originating in 29 vilayets [administrative divisions] of Turkey, 2,003 (88 per cent.) were found to bear *Tilletia foetens* [see preceding and next abstracts] and 274 (12 per cent.) *T. tritici* [*T. caries*], the predominance of the former species, especially in Anatolia, confirming previous observations on its preference for a continental climate [*R.A.M.*, xiv, p. 502]. The significance of sporadic anomalies in the local distribution of the disease remains obscure.

The average incidence of bunt in the Ankara division in 1935 was 16·8 per cent., the corresponding figure for 28 others being 15·5 per cent.; from occasional observations in 1936 the incidence of the disease was estimated at 22·7 per cent. The annual reduction of the Turkish wheat harvest through bunt is calculated at 400,000,000 kg.

Five ears from fields infected by *T. foetens* and *T. caries* were found to contain both species; as a rule the diseased grains yielded either one or the other, but occasionally the two were intermingled in one bunt ball. Eight out of 2,000 ears from widely separated districts contained spores of *T. caries* differing markedly from the normal in their exceptionally fine reticulation and the shortness of the surrounding ridges (invariably below 0·5 μ, sometimes only 0·3); the new transitional form

is provisionally named *T. tritici* f. *intermedia*. Various factors, including the circumstances of its occurrence, the appearance of the spore wall, and limited observations on the progeny of spores of the intermediate type, suggest that the new form arose through hybridization between the two bunt species [ibid., xvii, p. 665].

GASSNER (G.). **Untersuchungen über Keimgeschwindigkeit und Infektionsvermögen verschiedener Stämme von Tilletia foetens und Tilletia tritici.** [Investigations on the rapidity of germination and infection capacity of various strains of *Tilletia foetens* and *Tilletia tritici*.]—*Phytopath. Z.*, xi, 5, pp. 489–516, 1938.

Generally speaking, the wheat bunt (*Tilletia foetens* and *T. tritici* [*T. caries*]) spores from different grains of the same ear germinate at the same rate, whereas marked divergences in the rapidity of the process are observed among spores from different ears of the same collection. So constantly were these relationships maintained in recent comparative experiments in Turkey that it seems permissible to regard the spores of a single ear as a 'strain'. The fact that the germination rate of the spores of individual ears is an inherent character was demonstrated by laboratory tests in 1934 and 1935 on the progeny of 25 races of *T. foetens* from Ankara and 7 of *T. caries* from Sazova (Turkey) and Brunswick (Germany), the results of which disclosed a far-reaching correspondence between the parent races and their offspring in respect of this feature. Occasional discrepancies are attributed to the presence of more than one 'race' in the parent ear. Besides germination rate, other characteristics of the spores and spore powder and peculiarities of the germinating mycelium were found to be linked with individual bunted ears and their progeny.

The outcome of field experiments fully confirmed the above-mentioned interpretation of individual bunted ears as distinct 'strains'. The infective capacity of the spores of a bunt population derived from individual bunted ears varied far beyond the limits of experimental error. Moreover, the 'aggressiveness' of the spores from the individual ears of two test varieties of wheat (*vulgare* 85/30 and *durum* 211/29) was variable and to some extent conflicting, so that the strains in single ears evidently represent physiologic races.

Although no definite correlation could be discerned between the germination rate and virulence of the spores of individual strains, a higher incidence of infection on 85/30 was generally secured with rapidly germinating spores, while conversely, those germinating relatively slowly were more severe on 211/29; this difference appears to be related to the fact that 211/29 takes much longer to germinate than 85/30.

SNELL (K.). **Die Prüfung der Widerstandsfähigkeit von Getreide- und Rübensorten.** [The testing of resistance of cereal and Beet varieties.]—*Angew. Bot.*, xx, 6, pp. 446–453, 1938.

The following methods have been found useful in studies at the Biological Institute, Dahlem, Berlin, on the varietal resistance of wheat and oats to bunt (*Tilletia tritici*) [*T. caries*] and loose smut (*Ustilago avenae*), respectively. In the wheat tests the grains, after agitation in an Erlenmeyer flask with a weighed quantity of spores, are sown in

pots (30 per pot) filled with a suitable mixture of soil, 80 to 100 plants of each variety being sufficient for the determination of resistance. In the case of summer varieties the temperature should be maintained at 16° to 17° C. during germination, after which the seedlings are transferred to the greenhouse and kept at 20° under constant (day and night) illumination. Earing in early varieties takes place in about six weeks, by which time the spores can easily be extracted from the ovaries both of the fertilized and unfertilized flowers. The time required to reach a comparable stage in the field averages about six months, and the infection percentages thus obtained are much lower than in the greenhouse (on the Peragis variety 39·8 and 25·5 per cent. for collections VII and VIII of *T. caries*, respectively, against 100 and 87·6 per cent. and on the Endress variety 3·6, 1·9, 11·9, and 14·8 per cent., respectively).

Winter wheat grains are laid in shallow boxes and germinated at 10° in the dark, then transferred to daylight at 10° to 13° for further development (until completion of the first leaf), after which they are placed in a refrigerator (2° to 5°) and exposed for six weeks to eight hours' daily illumination by a 60-watt electric bulb. They are then transplanted in pots and maintained under the lengthened day conditions described for summer wheat.

The reaction of oats to *U. avenae* was tested by G. M. Reed's [ibid., xvii, p. 451 *et passim*] method of dehulling the grains by ten minutes' soaking in alcohol, followed by immersion in water, shaking up with spores in an Erlenmeyer flask, sowing in pots in soil of 25 per cent. water-holding capacity, and germinating in the cellar at 20°. On the emergence of the coleoptiles the plants were divided into two series, one of which was kept in the greenhouse with supplementary illumination, while the other was planted out in the open. Comparable results were secured in both lots in 1937.

The other experiments described relate to certain physiological characters in cereals and beets.

Crépin (C.), Bustarret (J.), & Chevalier (R.). **La résistance des variétés d'Avoine au charbon nu.** [Resistance of Oat varieties to loose smut.]—*Ann. Épiphyt.*, N.S., iv, 3, pp. 391–412, 1938.

In a brief account from the literature of the loose smut of oats (*Ustilago avenae*) the authors state that this is the most widespread disease of the crop in France [*R.A.M.*, xviii, p. 17], mainly because seed disinfection is still largely neglected by the smaller growers. In varietal resistance tests carried out at the Agricultural Experiment Station at Dijon from 1932 to 1937, high resistance was shown by Red Algerian, Red Rustproof, Baxter, and Woodford (all belonging to *Avena byzantina*), Mesdag, Markton, Kherson, and Richland (*A. sativa*), and Fulghum, Kanota, Burt 1–8–3, Navarro, Myall, Early Kherson, Warrigal, and Lampton (*A. byzantina* × *A. sativa*). It is pointed out, however, that so far very little is known concerning the physiologic races of the smut in France, though the evidence at hand would indicate that Mesdag, Markton, Navarro, Richland, Burt 1–8–3, Early Kherson 4, and an Algérie × Lochow cross may prove to be valuable as parents for developing varieties resistant to most of the smut forms that occur in that country.

Crépin (C.), Bustarret (J.), & Chevalier (R.). **Nouvelles recherches sur la résistance des Blés aux caries.** [Further investigations on bunt resistance in Wheat.]—*Ann. Épiphyt.*, N.S., iv, 3, pp. 413–447, 4 graphs, 1938.

In continuation of their studies on wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*: *R.A.M.*, xviii, p. 13] at Dijon, the authors found that in resistant wheat varieties seedling mortality induced by artificial inoculation of the seed with the local physiologic race of bunt did not exceed 22 per cent. either in the autumn or in the spring, and was fully compensated by a more abundant tillering of the surviving plants, the yield of which was equal to that of the uninoculated controls. Comparative tests with four bunt collections from France, one from Switzerland, three from Germany, and one from the United States, again confirmed the lower virulence of the French collections towards both winter and spring wheats. Immunity from, or very high resistance to, all the bunt collections tested was found in the autumn varieties Hohenheimer 77 (German), Hosar, Oro, Turkey, 7·366, Ashkof (American), and in the pure line 4 developed from Ridit at Dijon; two other pure lines (3 and 10) of this wheat were somewhat less resistant to certain of the bunt collections. All these varieties may be safely sown without seed disinfection. *Triticum timopheevi* showed no bunt infection in any of the tests. The American autumn varieties Hussar, Martin, and White Odessa were resistant to the French collections but more or less susceptible to the collections from Zürich, Cosel, and Breslau; the Hungarian variety Magyarovar 1, the Swiss Baulmes 6–1, and a selection of a local wheat from the Jura (Gillois 1) proved resistant to the Dijon collection, but variously susceptible to the other French collections. Of the spring wheats tried the American Hope alone was highly resistant to all the collections, and was followed by H 44–24, Hope × Reward, Hope × Reliance (lines 1–2 and 2–7–2), H 44 × Marquis, and Marquis × Emmer; a still less resistant class includes Marquis, Pentad × Marquis, Marquillo, Garnet, Dindiloa, Aurora, Extra-Club II, and Florence 135, the last-named of which appeared to be more resistant to the foreign than to the Dijon collection. The Dijon and Versailles collections were effectively separated by screening from races virulent towards the Baulmes and Hope × Reliance varieties, and from a race very virulent to Martin.

Further work on the genetics of resistance indicated that the Gillois I wheat has only one recessive factor for resistance to the Dijon bunt collection, while the line 9–9–1 developed at Dijon from Martin × K3 has two factors, one of which is dominant, for resistance to this collection. The fact that this line appears to have inherited some of the factors for resistance from the Martin parent, while differing from it in its external aspect and in its cultural characters, is considered to indicate that bunt resistance is inherited independently of morphological or physiological characters, a view confirmed by the results of all the crosses studied at Dijon; it is claimed to have allowed the authors to combine in their hybrids the resistance of parents such as Hussar, Martin, Baulmes, and Ridit with desirable cultural characters inherited from susceptible parents.

Selariès (P.). **Essais sur la carie du Blé en Alsace, Tilletia tritici (Bjerk.) Wint.** [Experiments on Wheat bunt in Alsace, *Tilletia tritici* (Bjerk.) Wint.]—*Ann. Épiphyt.*, N.S., iv, 3, pp. 481–484, 1938.

In giving an account of further experiments on wheat bunt [*Tilletia tritici*) [*T. caries*: *R.A.M.*, xviii, p. 12] at Colmar, the author states that the results in 1937 showed that local collections of bunt are more virulent on the susceptible wheat varieties B^2 and Bon Fermier than the collections from Breslau, Cosel, Halle, or Zurich; the propagation of the latter collections through several consecutive years on a susceptible variety did not result in their increased virulence to that variety, and the passage of a given collection through a resistant variety did not appear to increase its virulence to susceptible wheats.

Prévost (B.). **Memoir on the immediate cause of bunt or smut of Wheat, and of several other diseases of plants, and on preventives of bunt.**—Translated from the French by G. W. Keitt.—*Phytopath. Class.* 6, 95 pp., 3 pl., 1 fig., 1939. $0·75.

This translation of Bénédict Prévost's memoir is supplemented by a foreword, biographical sketch, and evaluation of the memoir by the translator, who regards the work, originally published in 1807, as the first recorded adequate experimental demonstration of the role of a micro-organism in the causation of disease. Besides accurately describing the symptoms of wheat bunt [*Tilletia caries* and *T. foetens*: cf. *R.A.M.*, xvi, p. 799], Prévost conducted successful inoculation experiments to establish its cause and to define the conditions favouring infection, and conducted toxicological studies in which he discovered that copper salts would prevent germination of the spores of the bunt fungus. On the basis of these results he carried out field trials on the control of the disease by steeping the seed wheat in a copper sulphate solution and gave detailed recommendations for carrying out this treatment on a large scale.

Rosen (H. R.) & Weetman (L. M.). **Factors affecting the longevity of urediospores of Puccinia coronata avenae.**—Abs. in *Phytopathology*, xxix, 1, p. 21, 1939.

Leaves of oats heavily infected by the uredo stage of crown rust (*Puccinia coronata avenae*) [*P. lolii*: *R.A.M.*, xviii, p. 242] were collected in June of two successive years and kept at various combinations of temperature (5° to 40° C.) and relative humidity (0 to 90 per cent.). Under outdoor conditions, with or without control of humidity, the spores were short-lived, but they remained viable and infectious for a year at 5° to 10° and 25 to 50 per cent. relative humidity. At 15° and 25 per cent. relative humidity, a small percentage of spores remained viable for nearly a year, while at 15° and 50 per cent. viability was retained for six months. The spores rapidly succumbed at temperatures above 15° at all the humidities tested. These data are considered to indicate that the uredospores of *P. lolii* are not instrumental in the perpetuation of the rust from year to year in Arkansas or any important oat-growing area of the United States.

JOHANN (HELEN). **Scolecospores in Diplodia zeae.**—*Phytopathology*, xxix, 1, pp. 67–71, 3 figs., 1939.

The writer has recently obtained scolecospores in agar cultures of *Diplodia zeae* isolated from rotted maize kernels [*R.A.M.*, xviii, p. 244] (*a*) collected in the field in Ohio in 1934, and (*b*) inoculated with the Ohio strain in the field at Madison, Wisconsin, in 1937. The scolecospores are hyaline, filamentous, 21 to 45 μ in length (mostly 25 to 35 μ), borne in fruiting bodies resembling the usual submerged pycnidia or in simple to lobulate and cup-shaped structures supported in pseudoparenchyma on the surface of the plate. Fructifications containing brown, bicellular pycnospores and those giving rise to scolecospores occur separately or in close proximity, and in some instances the two spore types, more or less segregated, have been observed in a single pycnidium. The conditions favouring scolecospore production are not altogether clear, but the presence in a culture of an averting strain of the fungus appears to stimulate the development of these organs, which grow best in subdued light and in tightly capped flasks. The scolecospores of *Hendersonina sacchari*, pathogenic to sugar-cane in India [ibid., xv, p. 703], closely resemble those of *D. zeae*, and the question of the possible relationship of the two organisms requires further consideration.

SCHROPP (W.) & ARENZ (B.) **Über die Wirkung von Bor und Mangan auf das Wachstum der Maispflanze.** [On the effect of boron and manganese on the growth of the Maize plant.]—*Phytopath. Z.*, xi, 6, pp. 588–606, 8 figs., 1938.

The effect of boron and manganese on the growth of maize plants was studied by the writers at Weihenstephan, Bavaria, in water and sand culture experiments, the elements being added to the nutrient media at a rate equivalent to 0·1 mg. per l. Maize plants grown without the addition of boron showed delayed growth, chlorotic foliage, long, white, transparent streaks on the leaves, abortive paniculation and ear formation, and lack of stamina; microscopic examination revealed further abnormalities of the leaf structure. The experimental symptoms of manganese deficiency also included delayed growth and severe chlorosis, but the reproductive system was not affected. Data are also given on the effect of boron and manganese on the chemical composition of the maize plant.

CARRANTE (V.). **La 'fetola' delle Arance e dei Mandarini.** ['Fetola' of Oranges and Mandarins.]—*Boll. Staz. Agrum. Frutt. Acireale*, 71, 7 pp., 3 figs., 1938.

At the commencement of the export season of 1938–9, oranges and mandarins in Sicily were widely affected by a type of blemish, referred to locally as 'fetola' and stated to be the same as oleocellosis [*R.A.M.*, xvii, p. 106]. In some groves all the fruits were attacked, but the condition was not observed on lemons. The areas of the fruit surface most commonly affected were those exposed to the north wind, those rubbing against other fruits, and the basal parts generally; the part near the peduncle remained unaffected. The Ovale and Calabrese orange varieties appeared to be immune. The prevalence of the condition may be reduced by improved cultural conditions and greater care in picking.

Baker (R. E. D.). **Report on a visit to Puerto Rico.**—*Proc. agric. Soc. Trin. Tob.*, xxxviii, 12, pp. 483–496, 1938.

The author reports the following diseases of grapefruit observed on his visit to Puerto Rico. Melanose, caused by *Phomopsis* [*Diaporthe*] *citri* [*R.A.M.*, xviii, p. 238], attacks both foliage and fruit, but apparently causes little damage; a common and serious disease is mottle leaf [loc. cit.], attributed to zinc deficiency, against which some of the estates have successfully incorporated one zinc sulphate-lime spray in their annual spray programme; gummosis (*Phytophthora* spp.) [loc. cit.] does a good deal of damage; while psorosis [ibid., xviii, p. 248] is not serious.

Scab (*Elsinoe fawcetti*) [ibid., xvii, p. 729] is stated to be present in varying degrees of severity in all areas, spoiling up to 50 per cent. of the fruit in seriously affected districts, where, it has been observed, the fruit is much more affected than the leaves. Generally scab is most important in areas of high rainfall and poor drainage, mild in those of low rainfall and good drainage, and of medium intensity in those of high rainfall and good drainage. The chief commercial varieties, Duncan and Marsh Seedless, are both very susceptible, whereas two specimens of Triumph, growing near severely diseased trees, showed no infection. Scab was also common on lemons, on the King orange, and on an unidentified orange of the mandarin type. Spraying in Puerto Rico is done almost entirely by power sprayers. A typical spray programme for areas lightly infected with scab includes the application of lime-sulphur at, or just after, the flowering stage, and again four to six weeks later, and in addition one zinc sulphate spray against mottle leaf; while that for heavily infected areas comprises a lime-sulphur or oil spray before flowering, Bordeaux (3–3–50) at petal fall, followed by an oil spray as soon as possible, lime-sulphur for rust mite control, again four to six weeks later, and a zinc sulphate spray against mottle leaf. The most essential time for spraying is just after blossoming but a reasonable degree of control can apparently be obtained as late as twenty days after petal fall, or even when the fruit is the size of a pea.

Nowell (W.). **Internal boll disease.**—*Emp. Cott. Gr. Rev.*, xvi, 1, pp. 18–24, 1939.

In this paper the author reviews the present state of knowledge on internal boll disease of cotton (associated with *Nematospora* [*coryli*], *N. gossypii*, *N. nagpuri*, *Eremothecium ashbyi*, *Spermophthora gossypii*, and other organisms, including bacteria) [cf. *R.A.M.*, xv, p. 719; xvi, pp. 35, 455; xviii, p. 248] and indicates the lines along which further investigation should proceed. The chief points still requiring elucidation are whether the insects responsible for the punctures by which the pathogens enter are the actual vectors of the organisms involved, and if so, the mechanism of such transmission.

Owen (O. P.). **Blue stain of Cotton caused by fungi.**—*Tech. Bull. N.C. agric. Exp. Sta.* 59, 12 pp., 2 figs., 1938.

In March, 1936, cotton left exposed throughout the winter in Piedmont and the Upper Coastal Plain of North Carolina showed a deep blue stain. Small pieces of fibre cut from the affected samples were grown on a sweet potato medium at 25° C. for ten days, at the end of

which period some 20 fungi were isolated and inoculated into clean, white cotton treated with 1/40, 1/20, and 1/10 molar solutions of dextrose. After three weeks at 28° two stains were outstanding, a yellow and a dark blue; the latter closely resembled that observed in the field and the causal fungus was further studied.

The mycelium on sweet potato is white with a faintly greenish tint at first, turning bluish- or greyish-black; on maize and oatmeal agars the characteristic colours are greenish and white or yellowish, respectively. The conidiophores are olivaceous, septate, mostly simple, and produce at their apices single or concatenate, dark brown, mostly non-rostrate, longitudinally and transversely septate conidia, measuring 15 to 63 by 9 to 20μ on filter paper and 15 to 31 by 12 to 18μ on cotton cloth. The fungus is identified as a species of *Alternaria* quite distinct from *A. gossypina* [*R.A.M.*, xvii, p. 674].

In inoculation experiments on sterilized slivers of mature cotton in distilled water in test tubes the blue stain began to appear in about three weeks and proceeded to discolour the whole contents of the tube. After three months or so a few spores developed. When nearly mature green bolls were inoculated in the laboratory, intensive staining occurred in five days. In baled cotton inoculated by placing an *Alternaria* culture in the centre of the mass, a uniform blue discoloration was found to have developed in a bale left in the field after 64 days' exposure, whereas one similarly treated and kept in a shed was not noticeably affected. After 174 days' storage in the laboratory a certain amount of staining was apparent in inoculated bales, but the discoloration was much less intense than that observed in the field tests. Definite staining also occurred in both bagged and unprotected bolls in the field 13 days after inoculation; overcast or rainy weather prevailed during the period of the tests, with average minimum and maximum temperatures of 61° and 74° F., respectively, corresponding almost exactly with the conditions favouring the growth of the fungus in culture. All attempts at the infection of greenhouse seedlings and field plants gave negative results.

WALLACE (G. B.). **Plant diseases spread by bugs.**—*E. Afr. agric. J.*, iv, 4, pp. 268–271, 1939.

A complete list, revised to 1937, is given of the host plants of *Nematospora gossypii* [*R.A.M.*, xvi, p. 455; ; xviii, p. 248], *N. coryli* [ibid., xvi, pp. 35, 597; xvii, pp. 162, 300; xviii, p. 248], *Spermophthora gossypii* [ibid., xiv, p. 693], and *Eremothecium cymbalariae* [ibid., xii, p. 566], showing the distribution of these fungi. Mention is also made of *N. nagpuri* on cotton in India [loc. cit.]. Notes are given on the diseases caused by fungi of this group on coffee, cotton, and legumes, and on methods of control.

LEPESME (P.). **Influence de la température et de l'humidité sur la pathogénie de l'aspergillose des Acridiens.** [The influence of temperature and humidity on the pathogenicity of aspergillosis of Acridians.]—*C.R. Acad. Sci., Paris*, ccviii, 3, pp. 234–236, 1 graph, 1939.

Further studies on the environmental factors involved in the development of the epidemic among migratory locusts (*Schistocerca gregaria*)

caused by *Aspergillus flavus* at the Central Laboratory of Acridian Biology, Paris [*R.A.M.*, xvii, p. 675] showed that a maximum temperature of 18° C. and a minimum humidity of 55 per cent. are necessary for the germination of the conidia, while the optimum temperature for mycelial growth ranges from 32° to 35°. Practically speaking, the fungus is pathogenic at 35° with a minimum humidity of 70 per cent. and highly so above 80 per cent. (death of the insects in three days); between these two limits other factors, as yet unknown, intervene to cause individual variations in the degree of resistance manifested.

Roubaud (E.) & Deschiens (R.). **Capture de larves infectieuses de Nématodes pathogènes par des champignons prédateurs du sol.** [The capture of infectious larvae of pathogenic Nematodes by predacious soil fungi.]—*C. R. Acad. Sci., Paris*, ccviii, 4, pp. 245–247, 1939.

The writers obtained from J. Comandon and P. de Fonbrune cultures of the nematode-destroying fungi *Arthrobotrys oligospora* and *Dactylella bembicodes* [*R.A.M.*, xviii, p. 251] and tested, under controlled experimental conditions, the capacity of those organisms for the capture of larvae of *Strongyloïdes fülleborni* and *Ankylostoma duodenale*, intestinal parasites of the chimpanzee and man, respectively. The fungi were found to produce their typical organs of capture within 48 hours and to entrap and ingest the nematodes exactly as in nature. The relatively large dimensions of the larvae (300 by 560 by 14 to 24μ in the case of *S. fülleborni*) apparently presented no obstacle to the predacious activities of the fungi with their mycelium of only 3 to 6μ in diameter.

Turu (H.). **Inokulationsversuche von Blastomyces am Mundwinkel von Mensch und Tier.** [Inoculation experiments with *Blastomyces* at the corners of the mouth on man and animals.]—*Fukuoka Acta med.*, xxxi, 9, pp. 1530–1540, 1 pl., 1938. [Japanese, with German summary on pp. 158–159.]

The pathogenic yeasts (*Blastomyces*) isolated from a typical case of perlèche at the Hukuoka University Dermatological Clinic, Japan, [*R.A.M.*, xvii, p. 528] were inoculated into the corners of the mouths of human subjects, rabbits, and guinea-pigs with positive results (especially marked in the case of the first-named) and recovered in pure culture from the affected areas.

Montgomery (R. M.), Hopper (Mary E.), & Lewis (G. M.). **Favus involving a toe nail.**—*Arch. Derm. Syph., Chicago*, xxxviii, 6, pp. 856–858, 1938.

Infection by *Achorion schoenleini* is stated to be relatively uncommon in New York, where only 18 out of 74,046 patients admitted to the Skin and Cancer Unit during the period 1935 to 1937 were affected by favus due to this organism. The present paper deals briefly with a case in a 28-year-old woman of active involvement of the right toe-nail, from which *A. schoenleini* was isolated, accompanied by evidence of healed lesions from the same source on the scalp and left thumb-nail.

Argenziano (G.). **Favo primitivo del braccio.** [Primary favus of the arm.]—*Rif. med.*, liv, 18, pp. 696, 699–700, 1 fig., 1938.

Clinical details are given of a case of primary favus of the right forearm in a 32-year old woman at Naples, contracted from her two children suffering from the same disease of the scalp. The organism isolated from the infected tissues was grown on Sabouraud's glucose and maltose agars and developed the typical features of *Achorion schoenleini* [*R.A.M.*, xvi, p. 610 *et passim*]. Inoculation experiments on guinea-pigs with material from mother and children gave positive results, and the fungus was recovered from the erythemato-squamous lesions thus induced.

Castellino (P. G.). **Eczematidi figurate in rapporto al Microsporon furfur.** [Figurate eczematids in relation to *Microsporon furfur*.]—*Rif. med.*, liv, 17, pp. 653–656, 2 figs., 1938.

Clinical details are given of two Neapolitan cases of figurate eczematids secondary to the typical manifestations of pityriasis versicolor and yielding to appropriate treatment of the original foci of infection, due to *Microsporon* [*Malassezia*] *furfur* [*R.A.M.*, xvii, p. 678].

Szathmáry (S.). **Das Epidermophyton luteum und seine Varianten.** [*Epidermophyton luteum* and its variants.]—*Arch. Derm. Syph., Berl.*, clxxviii, 3, pp. 216–224, 8 figs., 1938.

This is a very detailed account of the development on a number of standard media of cultures of an *Epidermophyton* isolated from the feet of two women at Pécs, Hungary, and characterized by pluriloculate (mostly 5), short-stalked spindles, 10 to 12 by 4 to 50 μ, spherical or piriform spores, 4 to 4·5 by 3·5 to 4 μ, chlamydospores 10 to 12 μ in diameter, and spirals 1 to 1·2 μ. The fructifications were arranged in spicate and botryose configurations. The fungus differs from the related *E.* Kaufmann-Wolf [*R.A.M.*, xvi, p. 809; xviii, p. 178] in various cultural characters, e.g., the sinuous and rimose central portion of the colonies with radiating furrows on maltose-containing substrata, the greenish-ochraceous colour, turning to purple in old cultures, the morphological peculiarities and canary-yellow tinge of peptone agar cultures, as well as in the positive outcome of inoculation experiments on guinea-pigs and human subjects. The fungus is named *E. luteum*, and two variants are described differing from the type in cultural characters.

Szathmáry (S.). **Epidermophyton gypseum flavum.**—*Arch. Derm. Syph., Berl.*, clxxviii, 3, pp. 225–233, 6 figs., 1938. [German.]

From an inflammatory lesion on the right upper arm of a 16-year-old boy at Pécs, Hungary, the writer isolated a hitherto apparently undescribed fungus which he designates as *Epidermophyton gypseum flavum*. Sabouraud examined the organism and placed it near *E. inguinale* [*E. floccosum*] but drew attention to some important cultural and morphological differences between the two, to which must be added the ready transmission of *E.g. flavum* to animals and human subjects.

On 4 per cent. Sabouraud's maltose agar the fungus formed greyish-white, velvety colonies, with piriform, occasionally elongated or oval,

biloculate spindles, 16 to 18 by 10 to 12 μ, and piriform conidia arising laterally from the aerial hyphae, 6 to 7 μ by 2 to 3 μ. On peptone at 20° C. the colonies were crateriform, sulcate, and greyish to greenish-yellow; intercalary or terminal chlamydospores were sparsely produced. Both on maltose and peptone the cultures smelt of decaying albumin. On gelatine concatenate chlamydospores, 12 to 14 μ, developed in profusion in addition to the spindles. The colonies on potato agar were ochraceous, with a prominent centre and flat, whitish, parchment-like periphery. Besides spindles oidia arose through hyphal disintegration.

Szathmáry (S.). **Epidermophyton sulfureum.**—*Arch. Derm. Syph., Berl.*, clxxviii, 3, pp. 269–275, 5 figs., 1938. [German.]

A hitherto apparently undescribed *Epidermophyton*, herein designated *E. sulfureum*, was isolated from inflamed, scaling lesions and blisters on the right foot of a 17-year-old girl at Pécs, Hungary. On Sabouraud's 4 per cent. maltose-peptone agar the colonies at three weeks were of a dirty sulphur-yellow colour, rugose at the centre, pulverulent, becoming smooth and greenish-yellow towards the periphery, which was surrounded by a narrow, white border and delicate actiniform halo. Both on this medium and on glucose-peptone agar the fructifications of the fungus developed in the form of spicate and botryose structures, with a few spindles. In subcultures on peptone agar in Erlenmeyer flasks the spherical or oval, almost exclusively intercalary chlamydospores, 7 to 10 μ in diameter, were often arranged in chains and mostly contained yellow granules. The circular or shortly piriform conidia measured 4·4 to 6 by 2·2 to 3·5 μ. The mostly 7-loculate spindles measured 40 to 50 by 10 to 12 μ.

Inoculation experiments on guinea-pigs and human subjects gave positive results, with retroculture of the fungus.

Gammel (J. A.) & Work (J. L.). **Sycosis parasitica due to Favotrichophyton album var. singulare.**—*Arch. Derm. Syph., Chicago*, xxxviii, 5, pp. 756–772, 7 figs., 1938.

From the beard of a middle-aged cattle-dealer suffering from sycosis parasitica (probably resultant on contact with 'scabby' sheep) the writers isolated a fungus which they consider to be a form of *Favotrichophyton* (*Trichophyton*) *album* [ibid., xvii, p. 599], identical with the fungus *F.* (*T.*) *singulare* (Cazalbou) Dodge, and they accordingly refer it to *F. album* var. *singulare*. In culture on Sabouraud's dextrose agar plus beef liver infusion the fungus produced a luxuriant cerebriform growth which yielded on further culturing a discoid type of colony. This in turn gave rise to the cerebriform type in one set of transplants. In hanging drop cultures on Sabouraud's dextrose broth the hyphae of the cerebriform type measured 1·8 to 4 (average 2 to 2·4) μ, and the intercalary or terminal chlamydospores 8 to 14 μ in diameter. In the discoid type the hyphae were generally more slender and showed fewer lateral protuberances than the foregoing, but rudimentary pectinate organs could be detected. There were fewer chlamydospores than in the cerebriform type. All cultures emitted a strong odour of ammonia, and were capable of liquefying gelatine.

Epstein (S.). **Presentation of the hypothesis that Trichophyton interdigitale is a degenerated Trichophyton gypseum.**—*J. invest. Derm.*, i, 2, pp. 141–168, 6 figs., 1938.

Trichophyton interdigitale (syn. *Epidermophyton interdigitale* and Kaufmann-Wolf's fungus) is stated to be indistinguishable microscopically or by animal inoculations from *T. gypseum* [*R.A.M.*, xvii, p. 818; xviii, p. 178]. Serial animal passages produced marked changes of virulence in both species, in the direction of attenuation in *T. gypseum* and in that of increased pathogenicity in *T. interdigitale*. There is a close analogy between epidermophytosis of the hands and feet, associated with *T.* spp. of the *gypseum* group, including *T. interdigitale*, and true *T. gypseum* infections of the hairy areas. As a result of further study, the author claims that *T. interdigitale* is a degenerated form of *T. gypseum* on the basis of the following considerations: (*a*) the variability of fungi in general and the cultural similarity of *T. interdigitale* and *T. gypseum*; (*b*) the similar effects of both fungi on guinea-pigs; (*c*) the biological parallelism between the two species (production of skin hypersensitivity to trichophytin and of epidermophytids and trichophytids, and invasion of the lymphatic system and blood stream); (*d*) epidemiological evidence, showing that when a severe epidemic of deep trichophytosis in Germany due to *T. gypseum* subsided it was shortly followed by an even more widespread outbreak of epidermophytosis (*T. interdigitale*); (*e*) the typical interdigital epidermophytosis developing in a previously non-infected human volunteer after inoculation with *T. gypseum*, and the retention of the normal characters in retrocultures of the fungus following experimental human passage and the production of the symptoms commonly ascribed to *T. interdigitale*.

A three-page bibliography is appended.

Perrone (P.). **Micosi delle tonsille (da 'Cryptococcus pinoysimilis' Cast. 1933.)** [Tonsillar mycosis caused by *Cryptococcus pinoysimilis* Cast. 1933.]—*Pathologica*, xxx, 560, pp. 241–242, 1938. [German and English summaries.]

A fungus isolated on Sabouraud's agar from nodules on the tonsils of a 40-year-old man at Bari, Italy, and grown at 37° C. was identified as *Cryptococcus* [*Candida*] *pinoysimilis* [*R.A.M.*, xv, p. 651].

Seaver (F. J.). **Fungi of the human ear.**—*Mycologia*, xxx, 6, pp. 692–694, 1938.

A case in New York of mycosis of the outer ear [cf. *R.A.M.*, xviii, p. 179] caused by *Aspergillus nigricans* is reported to have been successfully suppressed by swabbing with 50 per cent. alcohol, an ointment being applied to prevent irritation.

Rentschler (H. D.) & Scheifley (C. H.). **Fungous infections of the sinuses.**—*Arch. Otolaryng., Chicago*, xxix, 1, pp. 146–150, 1939.

In connexion with a brief report of a case of infection of the left maxillary sinus in a 49-year old woman in Pennsylvania by *Aspergillus niger*, the writers discuss previous records of fungal invasion of the sinuses, of which the earliest are stated to date from 1791 in France.

Békésy (N. v.). **Über parasitische Mutterkornkulturversuche.** [On parasitic ergot cultivation experiments.]—*Zbl. Bakt.*, Abt. 2, xcix, 14–17, pp. 321–332, 5 figs., 3 diags., 1938.

After summarizing previous outstanding contributions to the subject of rye ergot [*Claviceps purpurea*] cultivation for pharmaceutical purposes by saprophytic and parasitic methods [*R.A.M.*, xvi, p. 447], the writer describes his own experiments at the Budapest Drug Plant Institute in the procurement of inoculum.

Ears of winter rye were inoculated with an ascospore emulsion of the fungus through the closed flowers by means of an atomizer, and 6 to 12 days later the sticky drops of honeydew appeared. These may be collected either with the aid of a suction-tube or by washing off, and preserved in suitable containers, e.g. a retort-shaped vessel or an Erlenmeyer flask, maintained at temperatures not exceeding 35° C., and if necessary cooled off at 0° to 4°. The trial area of 13·5 sq. m. yielded 1 l. honeydew, which on dilution for field work produced 60 l. inoculum with conidia numbering 5,000 per cu. mm.

In addition ergot inoculum may be obtained by a saprophytic culture technique, as elaborated by Falck (*Pharm. Ztg*, lxvii, Nos. 73–75, 77, 79, 1922) and Kirchhoff [*R.A.M.*, viii, p. 560], and by the overwintering of conidia from the *Sphacelia* layers for which a cool, fairly moist atmosphere is essential, germinability being otherwise lost after four months. The conidia are best liberated by the immersion of the layers in a linen bag in water. On an average 1 l. inoculum may be secured from 10 kg. ergot by this method.

Field inoculation experiments were carried out with a machine equipped with four sets of two vertical rollers. One roller, covered with felt, presses the ears against the other. The latter is fitted with hypodermic needles, through which the inoculum is conveyed to the rye flowers. Two great advantages of this mode of inoculation are its economical use of infective material and its applicability at an early stage, viz., as soon as the ears are formed, so that the natural spread of the fungus is promoted and honeydew is produced by flowering time. Although this method is entirely independent of weather conditions and flowering time, various factors contribute to its success or otherwise. In order that insects may assist in the spread of inoculum, the plots should be situated in a low-lying, humid area close to meadows. Uniform growth of the plants should be secured by dense sowing and judicious manuring. The inoculum should contain 5,000 conidia per cu. mm., since the drops retained by the needles are minute and excessive dilution may result in failure. The collection of sclerotia should be made about ten days before the rye reaches maturity, and may be carried out by children. The yield in the trial plots of cultivated rye ranged from 90 to 190 kg. per hect. (up to 310 kg. in one instance), the corresponding figure for *Secale montanum* being 435 kg. Attempts to extract the sclerotia from threshed rye gave very unsatisfactory results, involving a minimum loss of two-thirds of the ergot.

No risk of ergot epidemics results from intensive production on the lines herein indicated, since the spread of infection is very limited, extending only about 4 m. from the source, and the sclerotia are short-lived (barely two years) and readily destroyed by ploughing. In

modern milling practice, moreover, the ergot content of the grain is reduced to the negligible minimum of 0·1 per cent., which has been authoritatively declared to be non-injurious to health.

Van Beyma Thoe Kingma (F. H.) **Beschreibung einiger neuer Pilzarten aus dem 'Centraalbureau voor Schimmelcultures' (Holland). V. Mitteilung.** [Description of some new species of fungi from the Centraalbureau voor Schimmelcultures, Baarn, Holland. Note V.] *Zbl. Bakt.*, Abt. 2, xcix, 18–23, pp. 381–394, 6 figs., 1939.

Latin and German diagnoses are given of *Margarinomyces luteoviridis* n. sp., *M. fasciculatis* n. sp., *M. hoffmannii n.* sp., all isolated from butter samples from Switzerland (the first-named also from Czechoslovakia), *Tilachlidium butyri* n. sp. from the same source (Denmark), *Scopulariopsis danica* n. sp. from an equine trichophytosis (Denmark), and *Penicillium humuli* from hops (Weihenstephan, Bavaria). An amended diagnosis of Laxa's genus *Margarinomyces* [*R.A.M.*, xiv, p. 471] is also given.

Rost (H.). **Untersuchungen über einige Krankheiten des Leins in Deutschland.** [Investigations on some Flax diseases in Germany.] —*Angew. Bot.*, xx, 6, pp. 412–430, 2 figs., 1 graph, 1938.

These laboratory studies were undertaken to throw light on some important points in connexion with the fungi attacking flax in Germany, where the cultivation of the crop has steadily expanded since 1933. The organisms were isolated from diseased flax stems on potato juice agar plates at 25° C. and either inoculated into unsterilized soil in pots, in which seed was subsequently sown, or sprayed in a spore emulsion over seedlings kept for three days under glass in a very damp atmosphere. The temperature requirements of the experimental fungi on potato juice agar were determined as follows: *Septoria linicola* (*Sphaerella linorum*) [*R.A.M.* xviii, p. 112] (Banat, Rumania), minimum, maximum, and optimum, 5°, 31°, and 20°, respectively; *S. linorum* (Argentine), 5°, 31°, and 22°; *Phoma lini* (Mark, Germany), 3°, 30°, and 25°; *Colletotrichum lini* [ibid., xviii, p. 256] (same origin), 8°, 32°, and 22°; *C. atramentarium* [ibid., xvii, pp. 96, 160] (Silesia), 9°, 33°, and 26°; *Fusarium avenaceum* and *F. culmorum* (Mark), 3°,32°, and 25° and 8°, 33°, and 25°, respectively; *F. lini* [ibid., xvii, p. 441] (Argentine and Uruguay), 9°, 33°, and 27°; *Botrytis cinerea*, 8°, 32°, and 23°; *P. lingam* from *Brassica* (Centraalbureau voor Schimmelcultures, Baarn) [ibid., xviii, p. 222] (included on account of recommendations in the literature not to plant flax immediately following cabbage), 9°, 31°, and 22°; and *F. oyxsporum* var. *aurantiacum* [ibid., xvi, p. 756; xvii, p. 368] from wheat in the Argentine, 9°, 32°, and 27°.

C. lini, one of the most virulent parasites of flax in Europe, Asia, and America, is widespread in Germany, where it is regarded as one of the main causes of 'soil sickness' in the crop. In the writer's inoculation tests it reduced germination by 90 to 100 per cent. Only slightly less extensive was the damage caused by *C. atramentarium* (80 to 90 per cent. decline of emergence), not hitherto recorded on flax. It was detected in association with *C. lini*, *F. avenaceum*, *F. culmorum*, *Alternaria tenuis*, and *B. cinerea* on plants rotting from the top downwards.

In the relatively cool climate of Germany, *F. lini* is of no great importance, and is in fact not represented among the European samples examined at the Biological Institute during the last decade. *F. redolens* [ibid., xvi, p. 434], isolated once from a German flax plant, caused a 75 per cent. loss of germination, while some of the surviving seedlings subsequently died of root rot. *F. avenaceum* was isolated not only from German samples, but also from a capsule of a flax plant of Russian origin; it caused a 50 per cent. reduction of germination in pot tests. *F. culmorum* is here reported for the first time as an agent of foot and root rot of flax, causing up to 100 per cent. loss among plants germinating under adverse weather conditions. *Gibberella saubinetii*, not hitherto described as a pathogen of flax, was isolated once from the straw of an Argentine sample. It proved to be very destructive in soil inoculation tests. Other species found on the rotted roots of older plants include *F. scirpi* and its var. *acuminatum*, associated with *F. lini* and *F. solani* on 'perennial' flax from Uruguay. *P. lini* is common on German flax, producing a dense coating of dark brown, bulbiform to spherical pustules, mostly measuring 0·15 to 0·34 by 0·12 to 0·27 mm. from the stem base up to a height of 10 cm. As in the case of other flax pathogens, the fungus is most aggressive during or shortly after germination, spares the surviving plants for a time, and recurs at the period of flowering and seed ripening, causing wilting and premature defoliation, while pycnidia are formed in masses on the stems. In inoculation tests germination was reduced by 40 to 60 per cent. *P. exigua* [ibid., xii, p. 372] was isolated in 1936 from a German plant, but has not yet been tested for pathogenicity. *P. lingam* caused losses of 80 to 100 per cent. in soil inoculation tests on flax. The damage caused by *B. cinerea* varies greatly according to the weather; an abrupt change from cool, moist to warm, humid conditions may entail the total loss of a stand from infection by this fungus. In the writer's tests the losses in 1936 amounted to 100 per cent., whereas in the exceptionally dry season of 1937 only 33 per cent. damage was sustained.

Middleton (J. T.) & Tucker (C. M.). **A disease of Gloxinia caused by Phytophthora cryptogea.**—Abs. in *Phytopathology*, xxix, 1, pp. 17–18, 1939.

Phytophthora cryptogea [*R.A.M.*, xvii, p. 181] was isolated from the dark brown, water-soaked, flaccid tissues of greenhouse *Gloxinia* (*Sinningia speciosa*) corms, stems, and leaves in California. Infection proceeds from the lamina to the petiole and, in severe cases, to the stem, the last-named (which may also be attacked in the absence of foliar symptoms) bearing sunken, water-soaked lesions of varying dimensions. Severely infected plants collapse and die. Diseased corms exhibit soft, depressed, superficial lesions, and in severe cases soft, dark brown, internal necrotic areas, 1 to 8 mm. in diameter, scattered irregularly throughout the tissues and not necessarily directly connected with the surface spots. Inoculation experiments with the fungus on the above-mentioned organs gave positive results. This is the first record of the disease in question in the United States, though an apparently identical rot has been reported from Europe [cf. ibid., xvi, p. 814].

Pape (H.). **Über fächerförmige Verbänderungen und gallenartige Sprossanhäufungen am Stammgrund von Chrysanthemum indicum.** [On fan-shaped fasciations and gall-like aggregations of shoots at the base of *Chrysanthemum indicum*.]—*Z. PflKrankh.*, xlviii, 12, pp. 598–604, 5 figs., 1938.

Three out of five *Chrysanthemum indicum* plants (Mona Davis variety) from a Kiel nursery, examined by the writer in 1937, bore a number of basal shoots characterized by an extreme type of fasciation; approximately terete at their site of insertion on the stem, they spread out fanwise at a height of 2 to 3 cm. from the base, the span of the 'fan' frequently covering 15 cm. while its diameter did not exceed 3 to 4 mm. Only a third of a quarter of these fan- or cockscomb-shaped shoots projected above soil-level; the subterranean portions generally gave rise to a number of shoots. The fasciated shoots were brownish to reddish-brown below soil-level, pink to whitish at the stem base, and the exposed parts pale green. Their surface was studded at regular intervals with small, triangular, scaly structures (obviously retrorse leaves), dark brown on the lower half of the shoot, colourless to whitish-green on the upper. The uppermost pectinate edge of the fasciated shoots frequently bore minute, green leaflets. The two remaining plants produced, in addition to fasciated shoots of the foregoing type, clumps of short, thick, fleshy shoots, with small, distorted, thickened leaves, as described by Williams and Miss Lacey from England under the name of 'leafy gall' [*R.A.M.*, xv, p. 724]. The German material was sent to Miss Lacey who isolated from it *Phytomonas fascians* [see next abstract]. presumed to be the agent of 'leafy gall' of chrysanthemum and other plants in England and the United States [ibid., xviii, p. 160]. Although inoculation experiments would be necessary to secure definite proof, the same organism is in all probability implicated in the causation of the disease in Germany. *P. fascians* was also isolated by Miss Lacey from *Pelargonium zonale* plants (Rubin variety) originating in the same nursery as the fasciated chrysanthemums and exhibiting similar symptoms.

Lindfors (T.). **En för Sverige ny bakterios.** [A new bacteriosis for Sweden.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, 6, pp. 81–82, 1 fig., 1938.

A brief note is given on the host range of *Phytomonas fascians* (stated to include garden peas and strawberries besides a number of ornamentals) in connexion with the detection of the typical symptoms caused by this bacterium on *Chrysanthemum maximum* [see preceding abstract] in Sweden. Although cultural experiments have not yet been undertaken, the identity of the causal organism, new to the country, is scarcely in doubt, and energetic control measures should be initiated to prevent its further spread.

Brierley (P.). **Two distinct viruses from the mosaic complex in Lilium longiflorum.**—Abs. in *Phytopathology*, xxix, 1, p. 3, 1939.

From Easter lilies (*Lilium longiflorum*) with typical mosaic flecking [*R.A.M.*, xvii, p. 531; xviii, p. 182] a virus of the cucumber mosaic

group may be isolated in cucumber, reinoculated therefrom into tobacco, lily, and other hosts, and recovered by the ordinary rubbing methods. Inoculations from flecked lilies induce mottling and breaking of tulip flowers [ibid., xviii, p. 257]. No symptoms develop on cucumber inoculated with the virus from broken tulips, which does, however, cause mottling of lily seedlings in ten days. The inoculation of tulips with the virus from severely mottled lilies also results in breaking, whereas cucumbers do not respond. Breaking also followed the inoculation of tulips with infective material from symptomless lilies (except seedlings), but cucumbers again failed to react. *L. formosanum* seedlings, inoculated by rubbing, develop pronounced mottling in ten days in response to the one or more tulip components of the complex; in the case of the cucumber component the reaction is less clearly defined. The cucumber mosaic-strain (resembling Price's) and the strong mottle virus (allied to McWhorter's latent lily virus) differ in other properties besides pathogenicity.

Gemmell (A. R.). **The degeneration of Metropolitan Bent.**—*Phytopathology*, xxix, 1, pp. 95–102, 4 figs., 1939.

Particulars are given of an apparently new disease of Metropolitan bent grass (*Agrostis stolonifera*), quite distinct from the brown patch due to *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvii, p. 186], in Minnesota and the neighbouring States. The leaves assume a greyish-brown discoloration at the tip and die off from the tip downwards. The roots of affected plants are abnormally short and brittle. As the disease progresses the dead bent is gradually replaced by *Poa annua*, giving a mottled appearance to the green, with the *Poa* growing erect among the remaining prostrate green bent and the brown, necrotic patches. The consistent survival of a few pale green plants gives rise to isolated light green spots in the midst of the brown areas and accounts for the popular name of 'freckle' for the disease. A comparison between the six-month-old root systems of the susceptible Metropolitan and the resistant Woodhill bents showed that the average root length of the ten longest of the latter was 17·7 cm. as against only 8·6 cm. in the former. The 'escaping' Metropolitan plants also had much longer roots than those succumbing to the disease, which is not amenable to control by mercurial compounds, aeration, or adjustment of the water schedule, and is thought to be caused by the deficiency of one of the accessory elements indispensable to plant growth.

Klemm (M.). **Schadgebiete des Kleekrebses (Sclerotinia trifoliorum Eriks.) in Deutschland, Kleesamenanbau und Witterung.** [Zones of injury from Clover stem rot (*Sclerotinia trifoliorum* Eriks.) in Germany, cultivation of seed Clover, and weather conditions.]—*Z. PflKrankh.*, xlviii, 12, pp. 605–618, 1 graph, 4 maps, 1938.

During the nine-year period from 1928 to 1936 the estimated reduction in the German clover harvest (based on official statistics) from stem rot (*Sclerotinia trifoliorum*) [see above, p. 299] amounted to roughly 40 per cent., corresponding to a financial loss of approximately RM. 47,000,000. A study of the maps of the distribution of the disease from 1925 to 1936 shows that 94 out of the 554 severely infected zones (16·9

per cent.) suffered heavy damage five or more years in succession; these were mostly situated in the principal clover-growing districts in north and central Germany, with sporadic foci in the south. This is a matter of serious concern since the best red clover [*Trifolium pratense*] seed comes from the north-east. Moreover, even the largest German harvests are quite inadequate for the needs of the country, and in Italy, the main source of supplementary imports, the damage from stem rot is six times as high as in Germany.

Although the chief zones of infection by *S. trifoliorum* are situated on loam, clay, and loess soils, no definite correlation could be established between soil constitution and the incidence of stem rot. On the other hand, there is no doubt that red clover does not respond favourably to improvement of the soil by loosening its texture, and in fact often thrives exceptionally well in seasons following a wet autumn, when the crop is liable to be trampled down by livestock. Stem rot is seldom observed in sheep-grazing regions. A decisive factor in the development of *S. trifoliorum* is the occurrence of abnormally high winter temperatures, especially in November, though October, December, and March are also of some importance in this connexion. No great influence on the course of the disease appears to be exerted by the amount of precipitation during the winter or the duration of the snow cover in March and April, but an abnormally large number of dull days in the former month predisposes the crop to infection.

Smith (O. F.). **Host-parasite relations in Red Clover plants resistant and susceptible to powdery mildew, Erysiphe polygoni.**—*J. agric. Res.*, lvii, 9, pp. 671–682, 4 figs., 1938.

The results of cytological investigations under greenhouse conditions at the Wisconsin Agricultural Experiment Station showed that the early stages of infection by *Erysiphe polygoni* [*R.A.M.*, xvii, p. 754] were the same on susceptible, moderately resistant, and highly resistant *Trifolium pratense* plants, on all of which the appressoria formed by the germinating spores directly penetrated the epidermal cells of the leaves, the early steps of penetration being accompanied by an ingrowth of the cell wall at the point of entry. After entering a cell of a susceptible plant the infection hypha developed into a simple haustorium with a vesicular distal portion, surrounded by a thick sheath with a conspicuous membrane. On highly resistant plants, the progress of the infection hypha was soon stopped by an antagonistic reaction of the host, the cytoplasm of which appeared to undergo some degree of disorganization around the point of infection, in some cases even before invasion of the cell was complete, terminating in the ultimate collapse of the infected cell. While in some plants the invaded cell alone became necrotic with no apparent injury to the adjacent cells, in others small brown necrotic areas were produced, involving a number of surrounding cells. Establishment of the fungus on moderately resistant plants was effected in much the same manner as on the highly susceptible, and a fairly congenial relationship appeared to be maintained with the host, growth on the surface of the plant being roughly in proportion to the degree of susceptibility of the latter. In one plant, however, necrotic spots appeared on the leaves about eight days after successful infection and

eventually killed them. It was observed that in both the susceptible and resistant plants the nucleus moved towards the fungus invading the cell.

Jones (F. R.) & Weimer (J. L.). **Stagonospora leaf spot and root rot of forage legumes.**—*J. agric. Res.*, lvii, 11, pp. 791–812, 3 figs., 1938.

A species of *Stagonospora*, identified as *S. meliloti* [*R.A.M.*, xv, p. 632], previously known only as a leaf-spotting fungus of several fodder crops, was found causing an undescribed root rot of lucerne in California and Wisconsin. At Riverside the disease occurred only on the upper part of the tap-root and on the crown branches, the lesions being dark brown to black, smooth at first but becoming rough. The disease progresses slowly, and requires several months to rot a medium-sized lucerne root. No new buds are formed and the plant eventually dies. At Madison the lesions strongly resembled crown rot due to *Phytomonas insidiosa* [*Aplanobacter insidiosum*]. A root rot of sweet clover [*Melilotus*] was readily produced by inoculations with this fungus but only once observed in the field. The disease is not easily recognized macroscopically but the fungus could be identified microscopically by the application of Gram's stain, which shows up the mycelium in the roots and large stems, but not that in the leaves. The root rot developed best at high soil temperature while the leaf spot appeared abundantly at low temperatures in early spring and late autumn. The fungus, which appeared to be a wound parasite, was found to produce three fruiting forms, viz. *S. meliloti*, characterized by a peculiarly shaped rostrum to the pycnidium; *Phoma meliloti* developing in the autumn; and *Leptosphaeria pratensis* appearing on dead stems in the following spring. In culture *S. meliloti* varied very much with age and origin, the mean length of the pycnospores ranging from 13 to 18 μ, these differences being apparently unrelated to the host sources. Some of the isolations from the more important hosts will infect sweet clover roots, though in varying degree, and isolations from sweet clover vary greatly in pathogenicity towards that plant.

The taxonomy of the fungus is discussed in some detail and a list is given of 26 species proposed as synonyms of *S. meliloti* by various authors, including *Asochyta affinis*, *A. medicaginis*, *Marssonina medicaginis*, *Septogloeum medicaginis*, *Gloeosporium medicaginis*, and *Septoria trifolii* Cav. No synonyms of *P. meliloti* are given, but those of *L. pratensis* include *L. dumetorum* and its f. *meliloti*, *L. eustoma* f. *major*, and *L. meliloti*. For the closely related fungus *Phleospora trifolii* var. *recedens* on *Trifolium pratense* the name *Stagonospora recedens* (Massalongo) n. comb. is proposed.

Stevens (N. E.). **Departures from ordinary methods in controlling plant diseases. Supplementary note.**—*Bot. Rev.* iv, 12, pp. 677–678, 1938.

In this supplementary note to his earlier paper on newly devised methods of plant disease control [*R.A.M.*, xviii, p. 125] the author cites, *inter alia*, a communication from R. C. Baines suggesting that collar rot of apple trees due to *Phytophthora cactorum* [ibid., xvii, pp. 254, 827] may be controlled by the use of resistant varieties to form the

roots and trunks and the grafting of Grimes on these stocks 30 in. or more above soil-level. Inoculation tests indicated that Northern Spy, Walbridge, Virginia Crab, Arkansas, and Hibernal are resistant and may be used as a stock for Grimes.

Cooley (J. S.) & Davidson (R. W.). **White root rot of Apple trees (Corticium galactinum).**—Abs. in *Phytopathology*, xxix, 1, p. 5, 1939.

Corticium galactinum, first observed as an agent of apple root rot in the United States by von Schrenk in 1902, seems to have been overlooked since that date in spite of its destructive character. Affected trees are rapidly killed, though the disease does not appear from the available evidence to be highly contagious. Trees inoculated with a monospore culture at transplanting developed 100 per cent. infection, whereas those similarly infected but left undisturbed in the nursery contracted only 50 per cent. A dense weft of mycelium covers the surface of the affected roots, the bark, cambium, and wood of which are subsequently penetrated and destroyed in irregular patches, appearing on removal of the cortex as light areas with dark, sometimes nodular or verrucose borders due to callus formation. Ultimately the entire root is killed. The hymenium of the fungus is white, later turning buff to ochraceous, and is formed in cavities in the soil surrounding the diseased root systems. *C. galactinum* has been found on dewberry, blackberry, Japanese wineberry [*Rubus phoenicolasius*], dogwood [*Cornus*], *Lychnis alba*, and sumac [*Rhus* (*?*) *copallina*] in the vicinity of infected apples.

McNew (G. L.). **Differential reaction of Apple varieties to Gymnosporangium juniperi-virginianae.**—*Res. Bull. Ia agric. Exp. Sta.* 245, pp. 117–142, 6 figs., 1938.

Collections of *Gymnosporangium juniperi-virginianae* [*R.A.M.* xvi, p. 618] from different localities in Iowa and seven other States were tested in Iowa in 1933 and 1935 on Bechtel's Crab and the following differential varieties of apples, listed in order of increasing resistance to the rust: Wealthy, Jonathan, Rome Beauty, York Imperial, Tolman, Ben Davis, Maiden Blush, Oldenburg (Duchess), Turley, Grimes Golden, Delicious, and Northwestern Greening. Most of the collections produced aecidia on Bechtel's Crab, Wealthy, Jonathan, and Rome Beauty; flecks with or without spermogonia on York Imperial, Tolman, Ben Davis, Maiden Blush, Oldenburg, Turley, and Grimes Golden; and flecks on Delicious and Northwestern Greening. On the basis of differential reactions of the varieties the collections could be classified into the following eight groups, the first four being considered potential parasitic races: (1) producing aecidia on Tolman and York Imperial; (2) causing a diffuse spreading fleck on York Imperial and defoliating Jonathan after large aecidial sori had been produced; (3) failing to infect Delicious and Northwestern Greening; (4) defoliating Turley after producing spermogonia; (5) failing to infect Northwestern Greening but causing typical flecks on Delicious; (6) producing a definite punctiform fleck on Ben Davis; (7) producing the same fleck on Ben Davis with spermogonia in most of the flecks; and (8) causing only a

few small, restricted yellow flecks on Turley. All collections studied, with the possible exception of group (3), penetrated the epidermis and became inter- or intracellular in the palisade layer. The hyphae from collections causing punctiform flecks on Ben Davis and Turley collapsed in the midst of injured cells of the palisade parenchyma. In group (2) the hyphae developed slightly further in York Imperial before collapsing in the cells of the spongy parenchyma. Collections producing spermogonia in the diffuse flecks on Ben Davis caused hypertrophy of cells in the spongy parenchyma, such cells collapsing in contact with the spermogonia before its maturation. The mesophyll cells underwent hypertrophy and hyperplasia before the formation of spermogonia in all varieties except Maiden Blush, in which the mycelium developed in the palisade layer and produced spermogonial initials, but cells of the spongy parenchyma appeared sensitive to the haustoria. The author postulates that the fungus must penetrate the spongy parenchyma cells without undue injury and stimulate them to grow before it can obtain sufficient food to develop further.

Dunegan (J. C.). **Germination experiments with overwintered teliospores of Tranzschelia pruni-spinosae.**—*Phytopathology*, xxix, 1, pp. 72–78, 1 fig., 1939.

Teleutospores of the *typica* variety of *Tranzschelia* [*Puccinia*] *pruni-spinosae* [*R.A.M.*, xvii, p. 756; xviii, p. 259], overwintered on fallen leaves of wild cherry (*Prunus serotina*) at the Arkansas Agricultural Experiment Station, germinated when tested on various dates between 11th February and 6th April, 1938. The same organs, scattered over the surface of water agar in Petri dishes, germinated profusely, producing short promycelia and forming basidia and spores, the last-named measuring 12·5 to 16 by 5·5 to 6·5 μ. In hanging drops of tap water germination was relatively scanty, the promycelia, basidia, and sterigmata frequently assumed abnormal shapes, and spore formation was at times suppressed. Under natural conditions basidiospore production probably occurs at irregular intervals following frequent saturating rains for a period of several months in the spring. Teleutospores of the *discolor* variety did not germinate in any of the experiments.

Hutchins (L. M.). **Apparent localization of phony disease virus in the woody cylinder.**—Abs. in *Phytopathology*, xxix, 1, p. 12, 1939.

Attempts at the transmission of phony disease of peach [*R.A.M.*, xvii, p. 125] from infected to healthy trees by means of patch-grafting gave uniformly negative results, but when whole sections of diseased roots, comprising both bark and wood, were grafted on the roots of normal trees, transmission was effected in every case in which growth union took place. The phony virus would thus appear to be localized in the woody cylinder, though direct proof of this hypothesis is not yet forthcoming. In this connexion it may be noted that the chemical laboratory test for phony disease [ibid., xiii, p. 38] gives a positive reaction only in the wood, the bark responding negatively. The inclusion of graft inoculum from both bark and wood in future experiments on suspected virus diseases of woody plants is recommended.

HUTCHINS (L. M.) & RUE (J. L.). **Promising results of heat treatments for inactivation of phony disease virus in dormant Peach nursery trees.**—Abs. in *Phytopathology*, xxix, 1, p. 12, 1939.

In January, 1937, two-year-old dormant nursery peach trees, inoculated a year previously with the phony virus [see preceding abstract], were completely immersed in hot water. All trees surviving an immersion of 40 minutes or longer at 48° C. made normal growth and were still completely healthy on 3rd October, 1938, when a negative reaction was given to a laboratory test for the disease. On the other hand, immersion for 35 minutes or less failed to inactivate the virus, as shown by the positive reaction to the test on the same date.

WENZL (H.). **Fleckenbildungen, Nekrosen und Wachstumsstörungen an Aprikosenblättern.** [Spotting, necroses, and growth disturbances on Apricot leaves.]—*Z. PflKrankh.*, xlviii, 12, pp. 588–592, 3 figs., 1938.

The leaves of cultivated and wild apricots and myrobalan [*Prunus divaricata*] in various districts of Austria have been observed for some years past to show various pathological manifestations of obscure origin. Greenish-yellow spots, 3 to 4 mm. in diameter, with irregularly radiating margins, develop on the upper side, mostly along the larger veins; on cultivated varieties necrosis of the centres of the lesions frequently ensues. On the petioles the spots assume an elongated shape and a corky, rimose aspect. Some of the diseased leaves retain their normal shape, while others are stunted or distorted in various ways. Shoots bearing a large number of affected leaves may also present a truncated appearance. Young trees, especially stocks, are more liable to the disorder than older ones.

The Austrian apricot disease, though probably of virus origin (bacteria and fungi being definitely excluded), was shown by a comparative examination to be distinct from the mosaic of the same host occurring in Bulgaria and Czechoslovakia [*R.A.M.*, xiv, p. 642; xv, p. 376], as well as from that of apricot and other *Prunus* spp. in France [ibid., xv, p. 515]. It approximates closely in its symptoms to leaf curl of *Pelargonium* [ibid., xvii, p. 684], and should be designated as 'leaf curl', pending further investigations. A similar malady appears to occur in Bulgaria on wild apricots, besides the true mosaic.

ANDERSON (O. C.). **A cytological study of resistance of Viking Currant to infection by Cronartium ribicola.**—*Phytopathology*, xxix, 1, pp. 26–40, 2 figs., 1939.

A cytological examination of foliage of the blister rust-resistant Viking red currant from Norway inoculated with *Cronartium ribicola* [*R.A.M.*, xviii, p. 39] at the New York State College of Forestry disclosed the presence of a few hyphae in young, fully expanded but unhardened leaves, entry having been gained by the germ-tubes through the stomata. The hyphae died, however, before the fungus was able to develop a mycelium capable of producing uredo- or teleutospores. Fully matured, hardened leaves, on the other hand, with one exception showed

no evidence of infection, though stomatal penetration by the germ-tubes had actually taken place. The immature leaves reacted to the penetration and temporary invasion of the hyphae by the production of minute, necrotic lesions subsequent to the death and dispersal of the mycelium. The cytological changes in the protoplasm of the rust and host are described.

The resistance of Viking leaves to infection by *C. ribicola* appears to be of a physiological rather than a physical order, since the non-infected foliage of the Norwegian currant did not differ in gross anatomical characters from three susceptible species. These cytological data confirm the results of extensive laboratory and field tests demonstrating the extreme resistance of Viking to blister rust. The Norwegian variety may therefore safely be distributed as cuttings without risk of disseminating the disease among other currants or five-needled pines, and its desirable horticultural qualities fit it for use as a parent in the breeding of rust-resistant varieties.

Barthelet (J.). **Recherches sur la mortalité des rameaux de Groseilliers.** [Studies on the dying-off of Currant twigs.]—*Ann. Épiphyt.*, N.S., iv, 3, pp. 495–512, 4 pl., 6 figs., 1938.

The cultivation of the black currant is stated to be seriously menaced in the Côte-d'Or Department of France by a disease of long standing, which every years kills off a number of the main branches and not infrequently results in the death of the whole bush. The trouble is more prevalent and spreads more rapidly among plants with a bushy habit than among black currants established on a single short stem, probably because of the more humid conditions at the crown of the former. The death of the twigs and small branches usually occurs very suddenly in the early spring, but may also take place throughout the year; occasionally an affected branch may put out feeble shoots which die gradually. During the winter diseased branches may be recognized by the slightly discoloured and slightly depressed cortex at their base. On decortication diseased wood exhibits a slate-grey discoloration extending from the base of the branch to over 10 to 15 cm., and usually starting from a pruning wound. The fungus constantly isolated from diseased material collected locally and in the experimental fields at Versailles was described in 1930 by Arnaud and the author as belonging to the genus *Phomopsis*, and was shown by further studies in pure culture to be identical with *Cytosporina ribis*, correctly renamed *P. ribis* by Grove [*R.A.M.*, iii, p. 433]; it is further believed that *Libertella ribis*, described from England by A. L. Smith, may also eventually prove to be identical with this species. In more recent years the perfect stage of the fungus was found by the author on red currant canes, on black currant twigs, and on gooseberry bushes growing in close proximity to infected black currants; the fructifications were distinctly of the *Eutypa* type, and further studies showed that morphologically the fungus may be referred to *E. lata*, in spite of some minor differences, which the author considers sufficient to constitute it a variety, *ribis*, of this species. The globose perithecia with a fairly short beak and a conical, obtuse ostiole, measuring 300 μ in diameter, are produced in stromata on the cortex, and separately inside the wood of denuded

branches; they contain numerous asci, 110 to 190 μ long, with long pedicels, the sporiferous portion being only about 40 μ in length; the asci contain 8 allantoid spores measuring 8 to 9 by 2 μ.

Notes are given on other fungi which, in the course of the investigations, were also found on species of *Ribes*, including *Nectria cinnabarina*, *Plowrightia ribesia*, *Botryosphaeria ribis*, *Botrytis cinerea*, *Diaporthe pungens*, apparently causing small cankers on red currant branches, and *Phragmodothella kelseyi* differing from *Plowrightia ribesia* in having triseptate spores. Two species occurring on dead *R. rubrum* twigs are described as new to science and named *Diatrype ribis* and *Botryodiplodia ribis*.

Shaw (H.). **The problem of spray residues on orchard fruit.**—*J. Soc. chem. Ind., Lond.*, lviii, 4, pp. 65–66, 1939.

In experiments at the East Malling Research Station on the joint control of the raspberry beetle (*Byturus tomentosus*) and the cane spot fungus (*Elsinoe veneta*) [*R.A.M.*, xvii, p. 447] on soft fruits of the raspberry-loganberry group, the use of the highly efficient Bordeaux mixture had to be abandoned on account of the complete disfigurement of the berries by the residue. The slight film of deposit left on the fruits by lime-sulphur was not considered important, but reports from canners drew attention to the deleterious action on the tins of berries carrying a residue of this type. A convenient substitute for use with the derris wash was found in copper oxychloride, which gave satisfactory disease control without leaving any appreciable traces on the fruit. Dusting strawberries with sulphur for the combined control of mildew (*Sphaerotheca humuli*) [ibid., xvi, p. 762; xviii, p. 191] and red spider (*Tetranychus telarius*) has to be discontinued for an appropriate period before picking in order to avoid the accumulation of an undesirable residue.

Grigsby (B. H.). **Physiological investigations of Red Raspberry plants inoculated with Red Raspberry mosaic.**—*Tech. Bull. Mich. agric. Exp. Sta.* 160, 27 pp., 4 figs, 1938.

A comparative study of the physiological activities of raspberry plants infected with mosaic and masked mosaic [*R.A.M.*, xviii, p. 190] and healthy plants of the Latham variety was carried out in Michigan. An analysis of the leaves showed a decrease in simple sugars and starches in the mosaic and masked mosaic plants and an increase of sucrose in the former. Mosaic and masked mosaic plants contained smaller amounts of total nitrogen and nitrate nitrogen but larger amounts of ammonia than healthy plants. Diastatic activity appeared to be greater in mosaic than in healthy or masked mosaic plants. Taking the photosynthetic activity of healthy plants as 100, the figures for mosaic-diseased plants were 64, 87, and 54 in three tests and those for respiration 100, 121, 134, and 142, respectively; the figures for masked mosaic in one test were 103 for photosynthesis and 114 for respiration compared with 100 for healthy plants in each case. The transpiration rate was found to be higher in mosaic plants (138) than in healthy ones (100) while that of masked mosaic plants (121) was intermediate. Stomatal counts showed that while there were 9·4 to 9·8

stomata per sq. mm. of leaf area on old and 15·0 to 15·5 on young healthy leaves, there were 25·5 to 31·6 stomata on old and 40·5 to 41·7 on young mosaic leaves. The chlorophyll content was 3·08, 2·97, and 2·61 mg. per 100 sq. cm. of leaf area for mosaic, masked mosaic, and healthy plants, respectively. Leaf ash analyses made by the spectrographic method showed that the afternoon figures for silicon and ash were generally lower than those of the morning, indicating a possible diurnal variation in salt content. The content of potassium was slightly higher in mosaic than in healthy plants and that of calcium lower.

WELLINGTON (R.). **The Strawberry problem.**—*J. Minist. Agric.*, xlv, 10, pp. 1008–1018, 1939.

Discussing the problem of virus disease in relation to strawberry-growing in England, the author points out that of the three distinct strawberry viruses present, yellow edge [*R.A.M.*, xvi. p. 762] and severe crinkle [ibid., xvii, p. 828] lead to the complete destruction of the plants, while mild crinkle [loc. cit.] appears to be of small economic importance. In theory, the normal yield of fruit should amount to 2 tons per acre, but actually 3 to 4 tons per acre are not infrequently obtained from virus-free plantings, though in those where virus disease is present the usual figure is 15 to 25 cwt. per acre.

The strawberry varieties at present grown fall into two groups, the Virginiana or British group (Royal Sovereign, Duke, Laxton, Sir Joseph Paxton, and Stirling Castle) and the Chiloensis or Continental (Madame Lefebvre, Madame Kooi, Oberschlesien, Tardive de Léopold, Brenda Gautrey, and Western Queen). The former varieties show much less resistance to virus attack than the latter, and are quickly destroyed, whereas the latter seldom, if ever, show symptoms even when the plants are heavily infected. Entirely virus-free plants are found only in the Royal Sovereign variety, though apparently perfectly clean Sir Joseph Paxton plants are now being tested.

The writer's personal experience as a grower has shown conclusively that heavy crops are obtainable if proper precautions are taken. Growers must confine themselves to the Royal Sovereign variety. Hybridists should concentrate on raising new virus-free varieties of the Virginiana group and cease to raise new varieties from the dangerous Continental group. A special bed must be made for runner production, planted with stock known to be virus-free, and situated at least half a mile away from all other strawberries. The runners must be planted on land not planted previously to strawberries, and each annual planting must be kept in a field not previously used for strawberries. Runners of this quality cost 40*s.* or 50*s.* per 1,000 but give an increased return of £80 to £150 per acre each year for two or three years. New fruiting plantations must also be as isolated as possible from older beds and other growers' beds, and before the new plantations are made, all heavily infected, older fruiting beds should be ploughed up. The life of the new plantations will be at most three years in the areas of concentrated strawberry-growing, and up to seven years if the plantations are isolated; probably, however, it would be advisable to plough up all fruiting beds after three crops.

MAGEE (C. J.), EASTWOOD (H. W.), & FOSTER (E. P.). **Control of squirter and black end diseases of Bananas. Success of the case dip.**—*Agric. Gaz. N.S.W.*, l, 1, pp. 22–24, 2 figs., 1939.

In a series of experiments carried out in New South Wales on the control of banana squirter disease (*Nigrospora sphaerica*) and black end (due mainly to *Gloeosporium musarum* and *Fusarium* spp.) [*R.A.M.*, xvi, p. 763], cases of fruit selected from plantations where these diseases were prevalent were dipped in shirlan AG at a concentration of 1 per cent., after being packed for market in the usual way. The fruit was than kept in Murwillumbah for four days, sent by train to Sydney, and there ripened by standard methods. The delay before dispatching was intended to correspond with the period usually required to reach distant markets. One week after ripening counts were made for squirter, and the prevalence of black end was estimated by inspection of one-half of each case as displayed to buyers. The result showed that squirter was completely controlled and black end virtually eliminated. In other tests, delay in dipping until 24 hours after packing did not reduce control, and the use of the dip at half strength satisfactorily controlled both diseases. It is recommended that bananas on dispatch to market during winter and spring should be given a routine dip in shirlan AG (0·5 per cent.). The dip should be freshly made each packing day.

WARDLAW (C. W.). **Banana diseases. XII. Diseases of the Banana in Haiti, with special reference to a condition described as 'plant failure'.**—*Trop. Agriculture, Trin.*, xv, 12, pp. 276–282, 1938.

In all parts of Haiti, Gros Michel banana plantations after five or ten months, or in the second or third year, develop leaf failure. In plants five to ten months old, the lower leaves may prematurely assume a yellow, yellow-brown, or dirty yellow and streaked appearance, and show spotting by secondary fungi. Later they turn brown or dark brown. Older plants develop yellow and discoloured, greenish-yellow, brown and fallen leaves prematurely in acropetal succession. In the second or third year, the leaves of affected adult plants appear short and narrow, and form an erect cluster round the 'throat' of the plant. A black mark is present where the petiole of the affected leaves meets the trunk, which gradually becomes pale yellow or pallid green. When the bunches are 'shot', they are found to be short-fingered, often with the top hand widely separated from the bottom hand. Occasionally, the plants are reduced in stature. This plant failure is attributed to a high rate of evaporation from the leaves, and the presence of some soil factor causing premature death of the rootlets, probably a high alkali content and inadequate supplies of essential minerals. Pronounced alkali chlorosis, probably a more advanced form of the same condition, also occurs in which the leaves, stems, and bunches may present all stages of chlorophyll deficiency.

A survey made in September and October, 1938, indicated that sigatoka disease (*Cercospora musae*) [*R.A.M.*, xviii, p. 264] was not fully epidemic in Haiti, but may be expected within 6 to 12 months seriously to affect fruit quality in some localities.

Panama disease (*Fusarium oxysporum cubense*) [ibid., xvii, p. 730]

was observed on Gros Michel bananas in the Artibonite area, the causal organism being isolated and cultured. The diseased stools are being destroyed with heavy gas oil. Owing to neglect and floods, infection is likely to cause heavy losses in the vicinity of Jacmel.

Moko disease (*Bacterium solanacearum*) [ibid., xvii, p. 760] was observed on moko plantains and Gros Michel bananas, but appears to be much less virulent in Haiti than elsewhere.

Stem rot (*Marasmius semiustus*) [*M. stenophyllus*: ibid., xv, pp. 451, 778] was present in the Cap Haitien area, where flooding had been succeeded by very dry conditions. Cigar end (*Stachylidium theobromae*) [ibid., xvii, pp. 50, 589] occurred occasionally on Gros Michel, affecting one to three fruits per bunch. Sun scald was present on some plantations, and at certain seasons irregularly developed bunches with twisted fingers and general lack of symmetry ('May' bunches) were frequently noted. Large dark spots and extensive pale spots or marginal blotches, resembling those attributed to *Helminthosporium torulosum* and *Cordana* [*Scolecotrichum*] *musae* [ibid., xvii, p. 331] were commonly present. The speckle attributed to *Chloridium musae* [ibid., xvii, p. 191] was noted in damp localities.

Gros Michel bananas were affected by the virus heart rot recently reported from Guadeloupe [loc. cit.]. In addition to striping and mottling of the younger leaves, dark purple and blue streaks appeared on the older ones, and small, water-soaked, later yellowish, and finally blood-red pockets were present along the whole length of the trunk, which had a bluish appearance, in the outer and inner leaf sheaths, and ultimately in the bulb. It is recommended that all infected stools should be destroyed and the disease made subject to official supervision.

Green-red bananas were affected by a virus disease of a type well known in the West Indies, characterized by streaky leaf mottle, but without any heart rot.

Barnett (W. L.) & Ward (F. S.). **Leaf spot disease of Bananas.**— *J. Jamaica agric. Soc.*, xlii, 11–12, pp. 555, 557, 1938.

In further tests carried out in Jamaica for the control of banana leaf spot [*Cercospora musae*: *R.A.M.*, xvii, p. 473] plots fertilized as well as dusted showed greater improvement than plots dusted only, while many plots fertilized but not dusted showed the same rate of improvement as those fertilized and dusted. Most of the plots were in a locality where the disease is present in a mild form.

Prolonged drought in the early part of 1938 was unfavourable to infection but also reduced the vigour of the plants, with the result that their susceptibility was increased when the next wet season set in. The plots in the coastal regions generally show marked resistance, especially those on sloping, well-drained, limestone soils. The demonstration plots in the hilly areas have given the most unsatisfactory results, largely owing to the cooler and wetter weather that prevails here. This favours the fungus and also makes satisfactory dusting difficult, though portable hand pump barrel sprayers are giving promising results.

It is concluded that frequency of spraying or dusting can safely be reduced, provided the ground is properly manured. Dusting at fort-

nightly intervals was not appreciably more effective than dusting at intervals of three weeks. Greater attention should be paid to improving the soil drainage and aeration, undrained areas showing a higher incidence of infection than drained ones. Noticeable improvement has followed dust treatment in cases of light infection, and where this has occurred the treatment should be continued. In badly affected areas (where dust treatment is uneconomic), all the plants should be cut down, and replanting carried out only after fertilizers have been ploughed in or added after forking.

STERN (J.). **Nuevos aspectos del problema del chamusco del Plátano en México.** [New aspects of the problem of scorch of the Plantain in Mexico.]—*An. Esc. nac. Cienc. biol., Mexico*, i, 1, pp. 161–167, 2 graphs, 1938.

The writer briefly discusses the climatic factors influencing the development of scorch [leaf spot] of plantain leaves (*Cercospora musae*) [see preceding abstracts] and summarizes the present situation in Mexico [*R.A.M.*, xviii, p. 192] and elsewhere in Central and South America in respect of the control measures initiated by the United Fruit Company. Stationary spray plants have been installed in Honduras and Guatemala, where treatments with 5–5–50 Bordeaux mixture are applied at 15- to 30-day intervals; dusting from aeroplanes with a mixture of monohydrated copper sulphate and lime (20–80) at the rate of 100 kg. per hect. is also carried out in the latter country, but has been abandoned as too costly in the former. The stationary system is considered to be beyond the economic scope of the Mexican plantain industry, and dusting is effected by means of motor-driven appliances. Both in Colombia and Haiti [see above, p. 327] a combined spray-dust schedule has been adopted. As regards Mexico, further consideration of the control problem is regarded as urgently necessary. As in Colombia and Haiti, there are two well-defined climatic zones in Mexico, namely, one of heavy precipitation, where it is thought fungicidal applications will be necessary throughout the year—at 20-day intervals during the rainy season and proportionately less often in comparatively dry periods—and a region of lower rainfall, e.g., Chiapa, in which the treatments need only be given shortly before and during the rains.

DAS GUPTA (S. N.) & VERMA (G. S.). **Studies in the diseases of Mangifera indica Linn. I. Preliminary observations on the necrosis of the Mango fruit with special reference to the external symptoms of the disease.**—*Proc. Indian Acad. Sci.*, Sect. B, ix, 1, pp. 13–28, 1 col. pl., 1939.

In this paper the authors give a detailed account of necrosis (or black tip) of mango fruits first recorded in Bihar in 1908 and in the United Provinces in 1923, and probably occurring in other localities. The first outward symptom is the development of a small, etiolated area at the distal end of the fruit, which gradually spreads until it covers the whole tip. As a rule, before etiolation is complete, isolated, greyish, indefinite spots appear, the tip turning a dirty green. The spots then become dark brown, enlarge, and coalesce into a continuous necrotic area. The tissues decay and the necrotic portion collapses. The pericarp and

mesocarp disintegrate, exposing the dark brown flesh, beyond which the stone protrudes, with a layer of collapsed tissue over it. Gummosis is frequently present. Marked differences were noted in varietal susceptibility, Dasehri mangoes showing 100 per cent. infection in the orchards studied, while Safeda (Narma) and Tambaria appeared to be immune.

No fungus or bacterium was isolated from affected material, and no definite evidence was obtained of any virus origin of the condition. Locally, the necrosis is attributed to the fumes from brick-kilns [*R.A.M.*, xvii, p. 259], but as it is not present in all orchards exposed to such fumes some other factors must be at least partly responsible. Lack of vigour in the trees appeared to be a contributory factor.

A condition referred to as 'taper tip' is characterized by an intensification of the normal green colour at the distal end of mangoes. The affected portion takes little or no part in the development of the fruit, with the result that in mature fruits the distal end tapers off suddenly and is frequently curved. Affected fruits fail to reach normal size and are readily detached from the stalk. Both the necrosis and taper tip may be present on the same fruit.

Kinman (C. F.). **Olive growing in the southwestern United States.**—*Fmrs' Bull. U.S. Dep. Agric.* 1249, 32 pp., 20 figs., 2 maps, 1938.

This bulletin (a revised version of one originally published in 1922) contains brief notes (pp. 31–32) on three diseases affecting the olive crop of California and Arizona, namely knot (*Bacterium* [*Pseudomonas*] *savastanoi*) [*R.A.M.*, xviii, p. 262], dry rot [regarded as a physiological disease by W. T. Horne et al.: ibid., iii, p. 323], and soft rot. The Manzanillo variety is the chief sufferer from knot, to which Ascolano, Sevillano, and other large-fruited varieties are resistant, and Mission almost immune. On the other hand, the large-fruited olives are very liable to soft rot, which prevents their use for processing. The shrivelling and browning due to dry rot are also troublesome in connexion with pickling, since lye is more readily absorbed by the diseased than by the surrounding healthy tissues.

Cristinzio (M.). **Una malattia del Pistacchio (Pistacia vera L.) causata da una Botryodiplodia.** [A disease of Pistachio (*Pistacia vera* L.) caused by a *Botryodiplodia*.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), vii, pp. 42–56, 1 pl., 1 fig., 1 graph, 1938.

Wilted two- to three-year old branches of *Pistacia vera* trees in Sicily showed dry, ashy-coloured, isolated or confluent, subelliptical sunken areas bearing circular or oval pustules (mostly in groups), ½ to 1½ mm. in diameter. The diseased bark showed small, longitudinal splits, which emitted a pale yellow resin, and the edges of the lesions showed cicatrice formation. In some instances, the lesions completely encircled the branch.

Below the pustules on the diseased parts were borne subspherical, slightly depressed, generally erumpent pycnidia, 600 to 1,200 μ in diameter, and 300 to 400 μ high, usually incompletely divided by hyaline or subhyaline septa. The hyaline, simple conidiophores measured

14 to 25 by 3 to 5 μ, while the ovoid or ellipsoid, elongated, straight or slightly falcate, hyaline, later olivaceous-brown conidia were rounded at the extremity, showed a clearly visible epispore, and measured 34 to 50 by 16 to 24 μ. The fungus is named [with a Latin diagnosis] *Botryodiplodia pistaciae* n. sp. The minimum, maximum, and optimum temperatures for germination were, respectively, 7°, 36°, and 22° C.

Inoculations of young branches of *P. terebinthus* by inserting fragments of a culture of the fungus in deep incisions made in the bark gave positive results in 25 days, by which time the fungus had progressed 12 cm. from the inoculation site; in 36 days the inoculated trees showed symptoms identical with those of natural infections.

The control measures recommended consist in removing and burning the withered branches, disinfecting the pruning wounds, and spraying immediately after leaf fall and again a fortnight before the buds open with Bordeaux mixture (4 per cent.) or alkaline polysulphides; in addition, applications of Bordeaux mixture (1 per cent.) should be made in spring, and after hailstorms or sudden drops in temperature.

Reid (W. D.). **Grease spot of Passion Fruit.**—*N.Z.J. Sci. Tech.*, A, xx, 4, pp. 260–265, 5 figs., 1938.

Considerable losses have been caused in various parts of North Island, New Zealand, during the past four years by grease spot of passion fruit (*Passiflora edulis*) due to *Phytomonas passiflorae* n. sp. [*R.A.M.*, xviii, p. 235], which produces on the fruits sharply defined, roughly circular, greasy patches; on the leaves brown lesions 0·5 to 15 mm. in diameter, those exceeding 2 mm. being surrounded by a pale yellow halo 4 to 6 mm. in width; on the young stems water-soaked, light brown, depressed areas, 10 by 5 mm., bordered by irregular swellings; and on the older wood lesions of various types, viz., circular, smooth, dark green, and depressed, 5 mm. in diameter, or dark brown, dull, and minutely fissured, 300 by 20 mm. The cortex is dry and spongy, often longitudinally split, and readily lifted from the underlying wood. Internally it is light brown, interspersed with small, dark brown streaks. The causal organism is irregularly distributed through the parenchyma. Various fungi, such as *Fusarium* and *Cladosporium* spp. and *Glomerella cingulata*, occur as saprophytes in old lesions. The disease is of great economic importance, reducing the market value of the fruit through disfiguring blemishes and in the garden causing defoliation, fruit drop, and death of the vines.

P. passiflorae makes good growth on standard laboratory media, e.g., beef peptone agar, at 21° to 27° C., developing singly or in pairs as capsulate, Gram-negative rods measuring 1·2 to 3·2 by 0·2 to 0·5 (average 1·5 by 0·45) μ or 2 to 4·3 by 0·25 to 0·5 μ, respectively; the organism is motile by one to five polar flagella; it forms flat, dry, shining, smooth, butyrous, translucent, greyish colonies; liquefies gelatine stabs; clouds nutrient and tryptophane broth; alkalizes but does not coagulate litmus milk; turns potato slices grey, dark buff, and finally dark brown at the top and light grey at the base; does not reduce nitrates, form indol or hydrogen sulphide, or hydrolyse starch; does not evolve gas from lactose, sucrose, glucose, galactose, raffinose, mannitol,

or starch; alkalizes lactose, raffinose, and glucose in twelve days; and acidifies galactose, starch, and sucrose.

The disease appears to be spread in the field by workers during handling operations and to persist from one season to the next in the infected tissues. Control should consist in the pruning out of dead material and thinning healthy vines to half a dozen leaders, to be trained over wires so as to facilitate penetration by monthly applications of 3–4–50 Bordeaux mixture. Prunings and fallen leaves and fruits should be burnt or buried, and heavily infected vines destroyed.

Specialpræparater til Bekæmpelse af Plantesygdomme og Skadedyr anerkendte af Statens Forsøgsvirksomhed. Gyldig for Aaret 1939. [Special preparations for the control of plant diseases and pests recognized by the State Experiment Service. Valid for the year 1939.]—*Tidsskr. Planteavl*, xliii, 4, pp. 683–690, 1938.

A number of proprietary plant protectives, officially tested and approved by the Danish State Experiment Service, are enumerated with the appropriate concentrations for use against various well-known diseases and pests.

Horsfall (J. G.). **Combating damping-off.**—*Bull. N.Y. St. agric. Exp. Sta.* 683, 46 pp., 7 figs., 2 graphs, 1938.

Based on nine years' experimental work at the New York State Agricultural Experiment Station, this bulletin presents a useful summary of information on the nature and control of damping-off, caused locally chiefly by *Pythium ultimum* and occasionally by *Rhizoctonia* [*Corticium*] *solani*, *Botrytis cinerea*, *Phytophthora* sp., and other fungi on a wide range of host plants. The protective value of seed treatments is stated to vary with the inoculum potential, defined essentially as the disease-producing power of the soil [*R.A.M.*, xii, p. 122]. As the inoculum potential increases, the protective value of the fungicide (red copper oxide in the author's experiments) declines, but not significantly until the inoculum potential reaches about 80 per cent. of the maximum, above which point it falls rapidly. About 0·5 mg. of metallic copper (as red copper oxide) per sq. cm. of seed surface is regarded as the minimum dosage. Seed disinfection with mercury, zinc, and copper, especially red copper oxide, is recommended as a protective measure, and in the case of seed-borne fungi, occasionally causing damping-off, such as *Gibberella saubinetii* on maize and other cereals, *Alternaria solani* on tomato, and others, it will practically eliminate the disease. A satisfactory treatment for small quantities of soil is a five minutes' immersion of soil-containers in boiling water. The new methods of working formaldehyde dust (1½ oz. per sq. ft.) into the soil or sprinkling it with ½ tablespoonful in a little water to each sq. ft. are stated to be rapidly gaining ground. Flushing sand with water at 160° F. until clean prior to planting the seedlings and watering with a weak solution of saltpetre (½ tablespoon per sq. ft.) is described as a promising technique. The zinc oxide treatment for the surface of the soil (½ oz. per sq. ft.) [ibid., xiii, p. 388], used in addition to seed disinfection, gives prolonged protection owing to its persistence, but its use is limited to certain soils where zinc is not injurious. The red copper

oxide spray (1 oz. to 3 gals. for seedlings) has tended to supplant the zinc oxide soil treatment. It must be used in addition to a seed protectant, is simple, cheap, and non-injurious to almost all plants except the cabbage family, and should be applied heavily, taking care that it runs down the stem into the soil. The dribbling of 1 in 100 formalin or 1 per cent. copper sulphate on to the seed at sowing produced striking differences in the stands of spinach and peas, and mercuric chloride (1 oz. to 10 gals.) applied in the same way gave good control of damping-off of cabbage.

MERRILL (R. M.). **The use of vapor spray in plant disease control.**—*Agric. Engng, St Joseph, Mich.*, xix, 12, p. 524, 1938.

Particulars are given of further developments in the writer's technique for the utilization of water vapour as a carrier for various plant protectives at the Ohio Agricultural Experiment Station [*R.A.M.*, xvi, p. 696]. Several changes were necessary to adapt the apparatus used in the preliminary tests to spraying on an agricultural scale, and details are given of the modified construction. To carry the hot vapour from the generator to the plants a ½-in. steam hose is used, during the passage through which the spray materials injected into the vapour line mix with the vapour and are released in a finely divided form at the nozzles. Mention is made, however, of certain disadvantages of the new equipment, including its relatively complicated construction, cumbersome method of operation, restricted utility in the case of tall trees in windy weather, and the adverse effect of heat on certain spray materials, though in the case of sulphur the heat induces a change from the crystalline to the amorphous state, thereby improving its adhesive properties.

MCLACHLAN (T.). **The decay of building materials with special reference to microbiological agencies.**—*Proc. Food Group, Soc. chem. Ind.*, i, pp. 48–71, 1938.

In this paper the author discusses in detail the reasons supporting his view that the exposed portions of a building constitute a soil, and that their decay is to a large extent a matter of soil microbiology. Chemical analysis showed considerable difference between the so-called sooty deposit on buildings and real soot, the black material of the former being organic in nature. More decay occurs in buildings in towns than in those situated in country districts because the growth of micro-organisms is encouraged by the larger amount of food material carried in the atmosphere of towns than is the case in the country, where ultra-violet light is also greater. Evidence is presented that moulds penetrate into the interior of stone through the pores and not only carry and liberate acid but also introduce bacteria [*R.A.M.*, xii, p. 645] and water. The first product of decomposition in building material is calcium carbonate, and not calcium sulphate as is commonly believed. The larger amount of sulphated material in decayed town (as compared with decayed country) buildings results from the heavy fertilization of the building materials in towns with sulphur and sulphur compounds. A sulphate skin acts as a protective covering on a building, as it prevents a ready absorption of water and foods for micro-organisms. The

sulphate in decayed building material is secondary to the main causes of decay, the micro-organisms causing which are carried in the air and in rain water. Fungi isolated from building materials and rain water from eleven different localities in Great Britain and abroad comprised 47 species belonging to 26 genera, including *Aspergillus* (6), *Cladosporium* (3), and *Penicillium* (13). Evidence was obtained that fungi can be grown in limestones, and that they can attack calcium carbonate and redeposit calcium salts in an oolitic form in the presence of colloidal material.

HILDEBRAND (E. M.). **Techniques for the isolation of single micro-organisms.**—*Bot. Rev.*, iv, 12, pp. 627–664, 1938.

After an introductory discussion of the pure culture concept, the author reviews a large number of techniques for the isolation of single micro-organisms by dilution, semi-mechanical, and mechanical methods, and concludes with a detailed description of the modified Barber method of using the Chambers micro-manipulator. A bibliography of 149 titles is appended.

VAN DER WERFF (A.). **A new parasitic organism in Zostera marina.**—*Chron. bot.*, iv, 6, pp. 498–499, 1938.

In the spring and summer of 1932 the author observed an organism on diseased eel grass (*Zostera marina*) in Holland [*R.A.M.*, xiii, p. 46], which he considers to be identical with the one found in North America and referred by Renn to *Labyrinthula* [ibid., xiv, p. 599; xv, p. 453; xvii, p. 543.]

TUTIN (T. G.). **The autecology of Zostera marina in relation to its wasting disease.**—*New Phytol.*, xxxvii, 1, pp. 50–71, 2 pl., 2 figs., 1938.

Following a discussion on the taxonomy of *Zostera* and associated marine angiosperms, the habitat factors of importance in the life of *Z. marina*, the autecology of this species and (more briefly) of *Z. hornemanniana*, the author describes the occurrence and symptoms of the wasting disease of *Z. marina* and sums up the evidence for its causation by (*a*) a bacterium, (*b*) *Ophiobolus halimus*, (*c*) a species of *Labyrinthula* [see preceding abstract], and (*d*) the discharge of waste oil from shipping. None of these theories is acceptable to the author, who attributes the phenomenon to the sunshine deficiency of 20 per cent. in the British Isles in 1931–2, a figure stated to be unequalled in any other of the past ten years. Recovery, being dependent on the regeneration of the plant from seed, is likely to be a slow process.

ATKINS (W. R. G.). **The disappearance of Zostera marina.**—*J. mar. biol. Ass. U.K.*, xxiii, 1, pp. 207–210, 1938.

The author states that T. G. Tutin's hypothesis [see preceding abstract] for the disappearance of *Zostera marina* from British waters is not supported by a study of the relevant meteorological data, which show, *inter alia*, that the mean sunshine values for 1931–2 are not outstandingly low. According to Dr. E. J. Allen of Plymouth, a scarcity of eel grass comparable to that now prevailing has not been observed within his 42 years' experience. A decrease in illumination, involving

a weakening in the constitution of the plant, is therefore quite an untenable theory of its disappearance.

SCHAEDE (R.). **Die Actinomyceten-Symbiose von Myrica gale.** [The Actinomycete symbiosis of *Myrica gale*.]—*Planta*, xxix, 1, pp. 32–46, 18 figs., 1938.

A detailed account is given of the writer's studies on the *Actinomyces* growing in the root nodules of *Myrica gale* on moorland soil on the Ostfriesland-Oldenburg boundary, Germany. The organism belongs to the group of symbionts already represented in association with alder [ibid., xvii, p. 568], *Hippophaë* [*rhamnoides*], and *Eleagnus* [ibid., xiii, p. 590]. On the basis of his observations the author differentiates two groups of *Actinomyces* root nodule symbionts, one in which the host assumes complete control over the endophyte and finally consumes it altogether, and another in which the intruder is permitted a certain degree of latitude culminating in the formation of bacteroids.

KOSER (S. A.) & SAUNDERS (F.). **Accessory growth factors for bacteria and related micro-organisms.**—*Bact. Rev.*, ii, 2, pp. 99–160, 1938.

This is a comprehensive review and critical discussion of the literature relating to the influence of accessory growth factors on the development of bacteria and related micro-organisms, including a number of fungi of different groups [*R.A.M.*, xvii, p. 409 and next abstract]. A bibliography of 179 titles is appended.

FRIES (N.). **Über die Bedeutung von Wuchsstoffen für das Wachstum verschiedener Pilze.** [On the importance of growth substances for the growth of various fungi.]—*Symb. bot. upsaliens.*, iii, 2, iv + 188 pp., 25 graphs, 1938. [English summary.]

Following a concise survey of the literature relating to growth substances since 1901, the writer describes a series of experiments to determine the influence of various strains of lignicolous bacteria on the development of eleven wood-destroying Polyporaceae, viz., *Fomes pinicola* [*R.A.M.*, xviii, p. 4], *Lenzites sepiaria*, *Polyporus* [*Polystictus*] *abietinus* [ibid., xviii, p. 284], *Polyporus adustus* [ibid., xviii, p. 215], *P. amorphus*, *P.* [*F.*] *annosus*, *P. benzoinus* [loc. cit.], *Trametes cinnabarina* [ibid., xiii, p. 532], *T. serialis* [ibid., xviii, p. 285], *P.* [*F.*] *fomentarius* [ibid., xviii, p. 280], and *Daedalea unicolor*. Synthetic nutrient (glucose-containing) solutions were developed enabling the bacteria and fungi to be cultured simultaneously on the same substratum.

A supply of 4 per cent. Seitz-filtered bacterial culture permitted the utilization of a nutrient solution of this type by *P. adustus* and *Polystictus abietinus* until the nutrients were exhausted. The development of the two fungi under observation was markedly stimulated by the addition to the nutrient solution of bacteria at the relatively low rate of 10,000,000 per c.c., whereas in peptone-containing media a more or less pronounced inhibition of growth was induced by high bacterial concentrations (1,000,000,000 per c.c.). This suppression was found to be due to the production by the bacteria of certain thermolabile substances counteracting the normal stimulatory effect of the auxin. In many instances the growth of the Polyporaceae on solid agar was similarly increased by the incorporation with the medium of 4 per cent. of

a sterile bacterial culture. None of the experimental fungi made appreciable growth in pure synthetic solutions, and in extensive tests with *Polyporus adustus* and *Polystictus abietinus*, using various sources of carbon and nitrogen, with the addition of copper, zinc, or manganese, no development took place. The growth occurring on the introduction into the synthetic media of 1·5 per cent. agar was shown to be induced by the presence of growth substances in the latter. The results of these tests are considered to justify the conclusion that at any rate some of the Polyporaceae under investigation are unable to assimilate synthetic solutions devoid of auxins.

The bacterial growth substances were found to be thermostable, capable of passage through a Seitz filter, insoluble in ether, and readily soluble in 88 (but not in 96) per cent. ethyl alcohol.

In a series of experiments to determine the influence of aneurin (vitamin B_1), biotin [ibid., xviii, p. 232], and inositol on fungal growth, only the first-named (used mostly at the rate 10 mγ per flask) afforded a powerful stimulus to the process, far exceeding that of the most active bacterial extracts. An absolute demand for aneurin (implying virtual failure of growth in its absence) was expressed by *Polyporus adustus*, *Polystictus abietinus*, *T. serialis*, *L. sepiaria*, *D. unicolor* (under certain conditions), *Valsa pini* [ibid., xv, p. 408] (which, together with *Lophodermium pinastri* [ibid., xvii, pp. 196, 214, 567] and *Melanconium betulinum*, also required biotin), and *Phytophthora cactorum* [ibid., xviii, p. 129]. Fungi with only a relative demand for aneurin (i.e., making slow growth without it) included *Nectria coccinea* [ibid., xviii, p. 280], *V. ceratophora* [*V. ceratosperma*: ibid., xvi, p. 562], and *Sclerotinia cinerea* [*S. laxa*], while the accessory element failed to improve the naturally abundant development on synthetic media of *Aspergillus niger*, *Fusarium conglutinans* var. *callistephi* [ibid., xviii, pp. 113, 234], and *Hypochnus* [*Corticium*] *solani*. A noticeable effect was exerted by aneurin and biotin on the fungi responding to their presence, e.g., *Polyporus adustus* and *Nematospora gossypii*, respectively (the latter also requiring inositol [ibid., xvii, p. 196]), even at concentrations as low as 1 in 250,000,000,000.

The efficiency of aneurin as a stimulant to fungal development was further demonstrated by means of growth curves expressing the quantity of mycelium obtainable per weight unit of aneurin added to the substratum in suboptimal concentrations. This value, designated the mycelium/aneurin quotient, was generally found to lie between 500,000 and 2,500,000.

On the basis of the comprehensive discussion of the experimental data herein presented, the influence of the growth substances is interpreted as a compensation for the partial or total inability of the fungi concerned to synthesize them unaided.

Waksman (S. A.) & Foster (J. W.). **Effet du zinc sur la végétation de Rhizopus nigricans et la production d'acide par cet organisme.** [The effect of zinc on the growth of *Rhizopus nigricans* and acid production by this organism.]—*C. R. Acad. Sci., Paris*, ccvii, 12, pp. 483–486, 1938.

Cultures of *Rhizopus nigricans* on a synthetic medium grew three

times more rapidly in the presence of an aqueous solution of zinc sulphate (5 or 15 mg. per l.), judged by the rates of glucose consumption, nitrogen assimilation, and fumaric acid production, than without this element. The compound appears to act as a catalyser of fumaric acid, into which part of the glucose consumed by the fungus is normally converted, but zinc also induces the formation of some other acid or acids as yet unspecified. In other tests it was shown that only a sparse aerial mycelium was formed in cultures devoid of iron and zinc, the addition of which to the medium profusely stimulated both vegetative development and sporulation.

DYKSTRA (T. P.). **A study of viruses infecting European and American varieties of the Potato, Solanum tuberosum.**—*Phytopathology*, xxix, 1, pp. 40–67, 6 figs., 1939.

Descriptions are given of the most prominent symptoms of the following viruses affecting different American and European varieties and some other Solanaceae in the writer's experiments, initiated at Corvallis, Oregon, in 1933, and continued after 1936 at the United States Horticultural Station, Beltsville, Maryland [cf. *R.A.M.*, xv, p. 738]: mild mosaic, crinkle mosaic, crinkle, leaf-rolling mosaic, paracrinkle, and the veinbanding, Y, stipple streak, X, and top necrosis B and C viruses.

The relationship between the different viruses was determined on the basis of (*a*) symptoms on various hosts, (*b*) protective inoculation, (*c*) serological reactions, and (*d*) physical properties, e.g., longevity *in vitro*, tolerance of dilution, and thermal inactivation. Mild and crinkle mosaics, originally described by Schultz and Folsom, and crinkle of European workers (crinkle A of Salaman), though not identical, were found to agree so closely in many respects that the virus, besides X, found in the complex causing each of the three diseases, may be regarded as closely related strains of the same virus, viz., the A virus of Murphy [ibid., xi, p. 740]. Leaf-rolling mosaic (Schultz and Folsom) [ibid., iii, p. 548], distinct from paracrinkle, is attributed to a virus given the new designation E [cf. Bawden's E, the virus of paracrinkle: ibid., xvi, p. 702; xvii, p. 833] with or without X, which seems not to influence the symptoms appreciably. Serological and physical property studies of the veinbanding, Y, and stipple streak viruses denoted a close relationship between the three, all of which are accordingly grouped under virus Y. No affinity could be detected between the veinbanding and cucumber mosaic viruses on the basis of potato and tobacco inoculations, and no protection against cucumber mosaic infection on tobacco was afforded by any of the Y strains. *Amaranthus retroflexus* was shown to be a host of virus X, of which Bawden's virus D, as already demonstrated [ibid., xiv, p. 328], is an aberrant strain. Potato Seedling 41956 was immune from all the strains of virus X tested. Virus B induced top necrosis [ibid., xv, p. 310] in the Arran Victory and President varieties, and is usually carried in a symptomless form, in addition to virus X, by Green Mountain. It was only rarely found in the Bliss Triumph, Burbank, and Earliest of All varieties grown on the Pacific Coast. All the American potato varieties tested reacted to inoculation with virus C by the development of top necrosis [ibid., xvi, p. 53] as a

current-season symptom. Tuber-perpetuated symptoms consist exclusively of mottling, which is also the sole response of healthy plants to grafting with scions from plants arising from such tubers.

Crépin (C.), Bustarret (J.), & Chevalier (R.). **Cultures de plants de Pommes de Terre en montagne.** [Cultivation of Potato planting material in the mountains.]—*Ann. Épiphyt.*, N.S., iv, 3, pp. 449–480, 6 figs., 4 diags., 1938.

The results of the extensive experiments described in this paper are stated to have largely confirmed the views of the first-named author [*R.A.M.*, xv, p. 597] on the effects of cultivation at high altitudes on the spread and development of virus diseases in potatoes [ibid., xviii, p. 233]. The comparative tests were made from 1932 to 1937, inclusive, with two Dutch (Eerstelingen [Duke of York] and Bintje) varieties, and one German (Cellini) grown from imported seed practically free from disease, and the French variety Industrie, completely infected with mild mosaic but showing slight, fugacious symptoms, at altitudes of about 200 m. and 850 m. in the Jura, 650 m. in the Morvan, and 1,550 m. in the Savoy mountains. At the lowest altitude the spread of virus diseases was very rapid. At the higher altitudes it was much slower and the degree of infection was much less intense, this effect apparently increasing with the altitude, though the minimum elevation for the production of disease-free seed material cannot be determined, since variable environmental, climatic, and ecological factors affect dissemination. The authors claim to have shown that healthy potato seed can be profitably produced in certain mountainous regions of France and that the country ought to utilize its numerous mountains for the production of all the seed potatoes it needs for itself and its colonies.

Fawcett (G. L.). **Una nueva enfermedad de las Papas.** [A new Potato disease.]—*Circ. Estac. exp. agríc. Tucumán* 67, 3 pp., 2 figs., 1938.

An account is given of a serious potato disease observed since 1937 in Tucumán, Argentine, and characterized by a chestnut discoloration of the tubers to which it owes its local name of 'chocolate'. In 1938, when it was less prevalent than in 1937, the incidence was estimated at 5 per cent. in a number of fields examined. The disease approximates most closely to internal rust spot [*R.A.M.*, xviii, p. 201], from which it differs solely in the absence of chestnut circles and concentric lines [characteristic of spraing, formerly regarded as a type of internal rust spot but now differentiated from it: ibid., xv, p. 468]. Only about half the 'chocolate'-infected tubers planted out at the Experiment Station in March, 1938, germinated and produced healthy plants, the remainder rotting in the ground. The use of tubers from diseased plants for seed is therefore not recommended. The White North American variety showed a certain degree of resistance to the 'chocolate' disease.

A disturbance [of the acronecrotic type] recently reported from Brazil under the name of 'vira-cabeça' ['twisted head'] [ibid., xviii, p. 202] also appears to be closely similar to the condition under discussion, except that the former, tentatively attributed to the 'corcova

['hunchback'] virus, is characterized by spotting and striping of the leaves and shoots.

WENZL (H.). **Die 'Gelbfleckigkeit' der Kartoffelknollen.** [The 'yellow spotting' of Potato tubers.]—*Phytopath. Z.*, xi, 6, pp. 607–616, 7 figs., 1938.

A new disease of potato, somewhat similar to 'Eisenfleckigkeit' [*R.A.M.*, xviii, p. 50], herein designated yellow spotting of the tubers as distinct from that of the foliage described by Appel (1927), was observed on the Kipfler variety near Vienna in 1936. The diseased tubers, when cut through, showed irregularly distributed deep yellow patches from 2 mm. to 1 cm. in diameter, which appeared translucent in thin sections of the tuber in transmitted light. Towards the spring some groups of cells of the affected parts of tubers became necrotic and turned brown, resembling at that stage the groups of dead cells in potatoes affected by 'Eisenfleckigkeit'. In most of the tubers no outward sign of the disease could be detected but some showed grey patches on the skin immediately above diseased tissue, the colour becoming darker and the skin sinking in when the cells died. Under the microscope the yellow patches were characterized by the almost complete absence of starch grains and by the presence of large masses of crystals 30 to 70 μ in diameter, and numerous yellow chromoplasts about 3 μ in diameter. The colouring substance of these chromoplasts was found to consist of carotin, large amounts of β-xanthophyll, and smaller quantities of a second xanthophyll. The crystals contained a glucoside and quercetin. Three out of four samples of Kipfler potatoes from different parts of the Danube valley, examined in 1937 and 1938, yielded an unexpectedly large number of diseased tubers.

KÖHLER (E.). **Über den vereinfachten Nachweis von X-Virus-Infektionen an der Kartoffel (vorläufige Mitteilung).** [On the simplified detection of X-virus infection on the Potato (preliminary note).]—*NachrBl. dtsch. PflSchDienst.* xviii, 12, pp. 104–105, 2 figs., 1938.

The writer recently isolated from the Up-to-Date potato variety a strain of the X virus, herein designated X^u and characterized by intense pathogenicity to Samson tobacco (Bashi Bagli Stalked), the expressed sap of diseased plants of which, transferred to Starchy potato leaves rubbed with carborundum, induces the formation on the latter of numerous irregular, black, necrotic spots. Such lesions did not develop, however, on the foliage of Starchy potatoes already infected by the X virus. Assuming the applicability of these results to other varieties, the inoculation of rubbed leaves of eye cuttings with the new strain would furnish a simple means of determining the presence or absence of the X virus without resorting to the complicated tobacco test. It is considered not unlikely that the new strain is identical with Bawden's virus B [*R.A.M.*, xvi, p. 53].

CLARK (C. F.), STEVENSON (F. J.), & SCHAAL (L. A.). **The inheritance of scab resistance in certain crosses and selfed lines of Potatoes.**—*Phytopathology*, xxviii, 12, pp. 878–890, 3 figs., 1938.

In preliminary experiments in 1935 on the inheritance of potato

scab (*Actinomyces scabies*) resistance in certain intervarietal crosses and selfed lines at Presque Isle, Maine [*R.A.M.*, xvi, p. 58; cf. also xviii, p. 200], the progeny of a cross between two susceptible parents, Columbia Russet and Katahdin, was completely susceptible, whereas a high degree of resistance was shown by the offspring of two highly resistant parents, Hindenburg and Ostragis. All the other 11 crosses segregated for resistance and susceptibility. The highly susceptible seedlings were immediately discarded, while the more resistant were subjected to a more severe test in 1936. In the progeny obtained, russeting was associated with a high degree of resistance to the pustule types of scab, but the absence of a complete correlation is shown by the fact that each cross contained a number of highly susceptible russeted segregates. Similarly, the whole progeny of the Hindenburg × Ostragis cross, as indicated above, was resistant to scab but segregated for red and white tubers, so that no connexion can be established between reaction to the disease and coloration. Comparing the progeny of selfed Katahdin (russet) with the white segregates of the Richter's Jubel × Seedling 44537 cross, it was evident that the factors for resistance involved in the cross are more numerous or more potent than those concerned in the selfed line.

Discussing the results obtained in the present investigation, the authors conclude that Green Mountain apparently breeds true for susceptibility to scab, Katahdin is susceptible but carries at least one heterozygous factor for scab resistance, Hindenburg and Ostragis are probably homozygous for resistance, and Seedling 44537 and Richter's Jubel are heterozygous.

A number of white-skinned seedlings have been produced that are highly resistant to scab and some of these approach commercial varieties in vigour and yield, though inferior in other characters.

Braun (H.). **Minderung des Pflanzkartoffelwertes durch Befall mit Alternaria solani.** [Reduction of seed Potato value through infection by *Alternaria solani*.]—*NachrBl. dtsch. PflSchDienst*, xviii, 12, pp. 105–106, 1938.

Some figures are cited to show the effect of *Alternaria solani* [*R.A.M.*, xv, p. 394; cf. ibid., xviii, p. 552] on the yield of the crop. Thus, in a preliminary test of 96 Flava tubers in 1937, half of which were attacked by early blight, the total yield from the sound lot amounted to 27·154 kg. and that from the diseased 15·920 kg., representing an approximate difference of 235·42 ± 33·88 gm. between healthy and infected plants. In an experiment in 1938 with 400 sound and 400 diseased Erstling [Duke of York] tubers, the former produced a total yield of 145·63 kg. compared with 113·24 from the diseased, a reduction of 22·4 per cent. as against 41·36 in the previous year, when the incidence of infection was considerably more severe. The difference in yield between healthy and diseased plants in 1938 amounted to 76·76 ± 10·46 gm. It is apparent from these data that early blight infection of the tubers may involve appreciable losses under a certain set of environmental conditions of relatively infrequent occurrence, the nature of which is not yet fully understood.

Magrou (J.) & Bouget (J.). **Présence de mycorhizes chez une Pomme de terre retournée a l'état sauvage.** [The presence of mycorrhiza in a Potato reverted to the wild state.]—*C.R. Acad. Sci., Paris*, ccvii, 26, pp. 1438–1439, 1938.

In one out of three potato root systems from various soil depths at Roquelaure, Gers, France, the roots were found to be extensively infested by a mycorrhizal endophyte [*R.A.M.*, xv, p. 255] occupying the central layer of the cortex, the non-septate mycelium of which formed arbuscular ramifications. Vesicles were not observed. The mycorrhiza under investigation are of the type commonly associated with the wild ancestor of the cultivated potato, *Solanum maglia*, in South America, and it is suggested that their presence accounts for the abundant spontaneous development of the local crop, which has received no cultural attention for the last 20 years.

Bose (S. R.). **The presence of encrusted cystidia in the hymenium of Polyporus zonalis.**—*Mycologia*, xxx, 6, pp. 683–684, 1 fig., 1938.

The author states that in the specimens of *Polyporus zonalis* [*R.A.M.*, iv, p. 636; xv, p. 471] (a common saprophyte) he examined from the eastern tropics and from the United States, he found heavily encrusted cystidia in the basidial layer within the pore tubes; on artificial media the cystidia become very prominent, giving a distinctly warty appearance to the whole culture. These bodies are claimed to constitute an important and reliable diagnostic feature of *P. zonalis*.

Allan (J. G.). **Soil covers on Rubber plantations.**—*India Rubb. J.*, xcvi, 25, pp. 724–725, 1938.

Creeping covers (e.g., *Centrosema pubescens* and *Pueraria*) over white root rot [*Fomes lignosus*] patches on Malayan rubber [*Hevea brasiliensis*] estates [*R.A.M.*, xvii, p. 836] have been found, in the early 'surge' of the disease from previously dormant centres, to carry heavy growths of rhizomorphs of the fungus. In the writer's opinion, the ideal method of dealing with a virgin clearing is not to stump it, but 18 months after burning to inspect all jungle stumps for white rot at a cost of 50 cents per acre. In such a search the presence of rhizomorphs on the covers is a distinct advantage, saving the labour of deeper examination. Bush (such as *Tephrosia candida*) and jungle (high blukar) covers show no aerial rhizomorphs, but prove useful as indicators of white root rot by dying off early as a result of infection.

The incidence of mouldy rot [*Ceratostomella fimbriata*] and of black stripe [*Phytophthora palmivora*] has been found to be equal under creeping covers and in clean areas, but bush or jungle covers over 3 ft. in height definitely encourage panel rots and should be lopped before the onset of the wet season.

The prime factor in the development of pink disease [*Corticium salmonicolor*] is considered to be the persistence of the dew belt; when the trees are seven or eight years old their branches are high enough to escape its influence at night, and the fungus causes no further trouble.

BEELEY (F.). **Covers in relation to the incidence and control of diseases and pests in Rubber plantations. Part I. Above ground diseases and pests.**—*India Rubb. J.*, xcvi, 25, pp. 725–727, 1938.

A cover of blukar and rubber [*Hevea brasiliensis*] seedlings has been found less likely to increase the incidence of mouldy rot (*Ceratostomella fimbriata*) in heavily infected smallholdings in Malaya [*R.A.M.*, xvii, p. 837 and preceding abstract] than grass (alone or with seedling blukar), while slashed seedlings or forest covers without grass are still more favourable in this respect. Creeping covers on limestone or coastal clay soils raise the degree of atmospheric humidity at 4 ft. above ground-level from between 65 and 70 to 80 per cent. and appear to promote the foot, panel, and stem canker group of diseases (*Phytophthora* and *Pythium* spp.) rather than mouldy rot.

Recent cross-inoculation experiments provided no evidence that the strain of *Corticium salmonicolor* from *Desmodium ovalifolium*, large areas of which have been killed by pink disease, is parasitic on rubber or vice versa. However, the appearance of the disease in the cover is thought to indicate the gradual development of conditions conducive to rubber infection, and at this juncture moderate slashing may be advisable to bring about a drier atmosphere. For the treatment of *C. salmonicolor* in young rubber plantings a water-miscible fungicide is recommended for green, and an asphalt-kerosene or tar mixture for mature brown bark. A disease of cover bushes liable to confusion with *C. salmonicolor* is caused by *Irpex subvinosus*, which produces a pinkish-mauve to nearly purple felt over several inches of the stem; it is not known to attack rubber.

ALCORN (G. D.) & YEAGER (C. C.). **A monograph of the genus Cunninghamella with additional descriptions of several common species.**—*Mycologia*, xxx, 6, pp. 653–658, 1 fig., 1938.

The authors give a description of the eight known species of the genus *Cunninghamella*, together with a key of the species. Soil forms of *C. elegans* [*R.A.M.*, xiv, p. 249] and *C. bertholletiae* have been encountered so different from the original descriptions as to be identified only after comparison with tester strains.

WAKSMAN (S. A.), UMBREIT (W. W.), & CORDON (T. C.). **Thermophilic Actinomycetes and fungi in soils and in composts.**—*Soil Sci.*, xlvii, 1, pp. 37–60, 4 pl., 1939.

In addition to six distinct types of thermophilic Actinomycetes of two genera, *Actinomyces* and *Micromonospora*, stable manure composts kept at 50° C. at the New Jersey Agricultural Experiment Station developed a very characteristic population of thermophilic fungi (reaching a maximum of 200,000,000 per gm. in ten days), the majority of which belong to the ill-defined group known as *Thermomyces* (*Ann. Inst. Pasteur*, xvii, pp. 217–240, 1903). This representative of the Fungi Imperfecti produces black chlamydospores on short lateral branches of the mycelium, and was found to be capable of decomposing the organic constituents of the substratum, including hemicelluloses, cellulose, and lignin, almost in their entirety: in an inoculation experiment it disorganized 40 per cent. of the total manure as compared with 62 per

cent. for the mixed population of thermophilic Actinomycetes and bacteria. The fungi appeared to be of great importance in the sequence of population in the 50° C. compost, developing profusely within 18 hours of incubation, sporulating rapidly, and being followed by bacteria, many of which seemed to grow largely at the expense of the mycelium.

Venkata Rao (M. G.). **The influence of host plants on Sandal and on spike disease.**—*Indian For.*, lxiv, 11, pp. 656–669, 3 pl., 1938.

The author states that with the object of finding a host of sandal [*Santalum album*] likely to induce immunity from spike disease [*R.A.M.*, xvi, p. 340; cf. also xvii, p. 626], 108 different host plants [which are listed] were grown with sandal in pot cultures and the sandal tested for resistance by artificial inoculation. In none of the combinations tried was the sandal immune from the disease; differences in susceptibility, if any, were generally slight and within the limits of experimental error.

Rands (R. D.) & Dopp (E.). **Pythium root rot of Sugarcane.**—*Tech. Bull. U.S. Dep. Agric.* 666, 96 pp., 4 pl., 12 figs., 7 graphs, 1938.

While the principal cause of sugar-cane root rot in the United States is *Pythium arrhenomanes* [*R.A.M.*, xvii, p. 487], twelve other species of *Pythium* and several other fungi have been isolated from decaying roots examined in surveys made in the Gulf States. These fungi were most prevalent in Louisiana, where the roots had been injured or weakened by various factors. Greenhouse infection experiments with these organisms failed to give the general root rot symptoms characteristic of *P. arrhenomanes*, while the same fungi did not act as secondary invaders to *P. arrhenomanes*. The addition of the toxic salicylic aldehyde [loc. cit.] (50 p.p.m.) to the soil, however, predisposed the sugar-cane to attack by several of these miscellaneous species, notably *P. dissotocum* [ibid., x, p. 211] and *P. graminicolum* [ibid., xvi, p. 561]. The results (together with survey records) indicate that none of these fungi is an important factor in sugar-cane rot disease save under very exceptional circumstances.

Greenhouse inoculation tests with over 200 isolates of *P. arrhenomanes* from Louisiana demonstrated the existence of physiologic specialization and of some degree of varietal adaptation in this species. There were also significant differences in the average virulence of the isolates as between different localities and the periods 1927 to 1931 and 1935 to 1936, actual increase in average virulence apparently having occurred between the two periods. This may, possibly, be due partly to the general adoption of newer and more resistant varieties, with the result that only the more virulent or adaptable components of the earlier population of the fungus survived.

The yield of the susceptible P.O.J. 234 variety in relation to the highly resistant Co. 290 and C.P. 807 varieties in comparative replicated field tests during the last eight years has shown marked decline and has been associated with an apparent increase in the severity of infection. Resistant varieties, on the other hand, have not shown any increased root rot. *P. arrhenomanes* is evidently a dynamic rather than a static factor in sugar-cane production, and resistance tests of new seedlings require artificial inoculation of the soil with the most virulent strains found in the locality.

In varietal field tests, most of the 'noble' canes were highly susceptible, while the Chinese canes (*Saccharum officinarum*) and the wild cane (*S. spontaneum*) were very resistant, and the Indian varieties of *S. barberi* were intermediate. F_1 hybrids from crosses between 'noble' and wild canes were generally resistant, but successive back-crossing to the 'noble parent' gave increasing susceptibility in the few cases studied. Among commercial varieties grown in Louisiana, Co. 290, C.P. 807, C.P. 28/11, and C.P. 29/116 are resistant to root rot and sufficiently vigorous to plant in mixed and heavy soils, though C.P. 807 is very susceptible to red rot (*Colletotrichum falcatum*), to which C.P. 29/320, so far not seriously affected by root rot, has also been reported as susceptible. Co. 281 and C.P. 28/19 are susceptible to root rot, and as a rule grow successfully only in light, well-drained soils.

Evidence was obtained confirming the view that high winter rainfall and low spring temperatures increase the damage to canes planted in the autumn. The heavy losses in yield sometimes incurred when C.P. 28/19 is planted in October in heavy soils were obviated by summer planting. In tests in controlled soil temperature tanks root rot was most severe at 65° to 68° F., becoming progressively less serious with increasing temperatures up to 97°. Improvement of root rot soils by the continued ploughing in of all trash, moderate applications of factory filter-press cake, or stable manure, and good drainage appreciably reduced root rot damage in susceptible canes. Increased root rot of plant cane has also been observed apparently to result from excessive nitrogen fertilization of the parent crop.

Abbott (E. V.). **Red rot of Sugarcane.**—*Tech. Bull. U.S. Dep. Agric.* 641, 96 pp., 10 pl., 7 figs., 3 graphs, 1938.

A detailed survey carried out in the sugar-growing areas of the United States indicated that the light and dark races of *Colletotrichum falcatum* [*R.A.M.*, xvi, p. 127: xvii, p. 67] have been responsible for the failure of P.O.J. 213 and the decline of C.P. 807, respectively. In the syrup-producing States the dark race predominated from 1930 to 1937, but in 1938 the light race predominated on all varieties except Cayana; only light-race isolates were found in Florida.

Measurements of the conidia of 81 isolates failed to establish any correlation between conidial size and the cultural characters differentiating the light and dark races, which, further, could not be differentiated by rate of growth in culture. The optimum growth temperature for the fungus was from 30° to 32·5° C.; growth was poor at 37°, slow at 15°, and absent at temperatures below 10°. Dark- and light-race isolates indistinguishable from those obtained from sugar-cane leaves and stalks were obtained from the midribs of the leaves of *Sorghum halepense*, *S. vulgare*, and *Erianthus giganteus*.

Infection of sugar-cane leaves was found to be important as a primary source of conidial inoculum for stalk infections. Leaf infection generally occurs through wounds made by insects, but penetration of apparently uninjured epidermis may take place. Stalk infections of standing cane find ingress largely through the tunnels bored by *Diatraea saccharalis* and, in some highly susceptible varieties, through the root primordia. Infection may also take place through the cut ends of

seed cuttings. The disease develops in winter in seed cane from infections that have taken place before cutting and planting. During spring, conidia produced on trash, pieces of seed cuttings, and stubble rhizomes serve as sources of inoculum for infection of the leaves. No evidence was obtained that the fungus persists in the soil.

Tested on the resistant Co. 281 and the very susceptible P.O.J. 213 canes, the light race from Louisiana was, as a rule, more virulent than the dark race from the same State, the latter being more virulent, however, than either the light or dark race from the syrup-producing States. The two races from the last-named region were of approximately equal virulence.

Comparison of light-race isolates from P.O.J. 213 in Louisiana with light-race isolates from other commercial varieties demonstrated that the P.O.J. 213 isolates were, as a group, significantly more virulent than the other groups, except those from P.O.J. 36–M. The dark-race isolates from C.P. 807 taken from localities where infection was severe were significantly more virulent than those from areas where this variety was less severely affected. Differences in relative virulence were found among the dark races similar to most of the light races. Evidence was obtained that the absence of red rot injury to P.O.J. 213 in the syrup-producing States is due to the lower virulence of the races of *C. falcatum* present. Hence, although well-defined physiologic races could not be differentiated, a degree of specialization within both the light and dark types was established.

The results of laboratory and field inoculation tests showed that very vigorous but susceptible cane varieties may suffer less severely from red rot than more resistant but less vigorous ones. Moderately resistant varieties susceptible to root rot [chiefly *Pythium arrhenomanes*: see preceding abstract] were sometimes more severely injured by red rot than susceptible varieties resistant to root rot. High susceptibility is characteristic of *Saccharum officinarum*, while of two varieties of *S. barberi* one was very susceptible and one moderately resistant; *S. sinense* was only slightly less susceptible than *S. officinarum*, and the one variety of *S. robustum* tested was susceptible. Of 14 varieties of *S. spontaneum*, 13 were moderately resistant and 1 was very susceptible.

A study of the distribution of resistance among the seedlings of four complete progenies failed to disclose any correlation between resistance and the growth habit of the female parent, Co. 281, the agronomic character of the seedlings, or the sucrose content of the juices. From other evidence it was concluded that Co. 281 is of high value as a parent in breeding for resistance.

In C.P. 807, resistance of the host tissues to the spread of the fungus was found to be more important than resistance to invasion through the root primordia. The principle of resistance appears to be contained within the protoplasm.

CAMINHA (A.). **Correlation between intensity of mosaic infection of Sugar Cane and environmental adaptability.**—*Brasil assuc.*, xi, 6, pp. 30–33, 1938. [? Portuguese. Abs. in *Facts ab. Sug.*, xxxiv, 3, pp. 39, 1939.]

Certain soil and atmospheric conditions have been observed to predispose sugar-cane to a greater or lesser degree of susceptibility or

resistance to mosaic. For instance, certain varieties, such as P.O.J. 213 and 36, are resistant in the Argentine, somewhat tolerant in the southern States of Brazil, and definitely susceptible in the tropical regions of the north [*R.A.M.*, xvi, p. 126]. The variety H. 109, absolutely immune in Hawaii, has succumbed to mosaic in most or all of the other countries to which it has been transplanted, while P.O.J. 213 is also extremely susceptible in Java. These observations might suggest that the virulence of mosaic tends to be greater in tropical regions than elsewhere, but the reverse is the case with Diamond 10, resistant and a prolific yielder in British Guiana but highly susceptible when transplanted to the subtropical Argentine. Possibly the explanation of this complex problem lies in an alteration of the ability of the plant, on transference to new surroundings, to develop antibodies repelling the mosaic virus.

Pickel (D. B.). **As molestias mais perniciosas da Cana de Açucar en Pernambuco.** [The most serious diseases of Sugar-Cane in Pernambuco.]—*Biologico*, iv, 11, pp. 361–367, 2 figs., 1938.

The author states that sugar-cane mosaic in Pernambuco is very nearly extinct, chiefly owing to the climate, which is distinctly favourable to the crop, but also in consequence of the measures carried out for its eradication. The only serious disease of sugar-cane in that province is a root rot, the first symptoms of which become apparent at the beginning of the dry season, very frequently terminating in the death of the affected stools. It is especially prevalent on hard clay soils, or in fields subject to waterlogging during the wet season. The primary cause of the trouble is considered to be root asphyxiation, and the very frequent association of *Himantia stellifera* [*R.A.M.*, xvii, p. 299] with it is held to be secondary.

Bitancourt (A. A.). **'Pyrenochaeta sacchari n.sp.' e uma mancha da folha da Cana de Açucar.** ['*Pyrenochaeta sacchari* n.sp.' and a leaf spot of Sugar-Cane.]—*Arq. Inst. biol., S. Paulo*, ix, 27, pp. 299–302, 2 pl., 1938. [English summary.]

An account is given of an apparently undescribed leaf spot observed by the author in the autumn of 1937 on sugar-cane of the EK 28 variety in plantings of the Phytopathological Section at Cantareira, São Paulo. The first symptom develops on relatively young leaves in the form of small, regular, oval, well-delimited, and almost pure white spots, 1·5 to 6 by 1 to 3 mm., on the lower surface, the corresponding spot on the upper surface being smaller and much less conspicuous. These chlorotic markings are more or less dispersed, but when numerous, as, for instance, in the apical half of the leaves and along the two sides of the main vein, they may coalesce. On ageing the individual spots become surrounded by a thin, Corinthian purple line and assume a vinaceous-buff colour; where the spots coalesce the purple line disappears between the spots but surrounds the whole aggregation, which may attain considerable size and is very irregular in shape. In their later stages of development the spots may be confused with those due to *Leptosphaeria sacchari*. All the spots examined bore amphigenous pycnidia of a fungus which is described [with a Latin diagnosis] as new to science under the name *Pyrenochaeta sacchari*. The pycnidia are

superficial or slightly immersed, colourless at the base but blackish towards the apex, mammiform or subglobose, 50 to 100 μ in diameter, glabrous or provided with 1 to 20 radially disposed, erect or tortuous, fuliginous, cylindrical, apically obtuse setae, from 5 to 40 by 2·5 to 5 μ. The conidia are hyaline, continuous, oblong, subacute at the apex, and 6 to 12 by 3 μ in diameter. The author states that inoculation experiments with the fungus have, so far, given negative results, but its constant association with the leaf spot leaves little doubt of its pathogenic activity.

Pilát (A.). **Liste der von A. C. J. Corda beschriebenen Pilzarten, mit Angabe der Originalexemplare, die im Herbarium des Nationalmuseums in Prag aufbewahrt sind.** [A list of the species of fungi described by A. C. J. Corda, with information on the original specimens preserved at the herbarium of the National Museum in Prague.]—*Acta Mus. nat. Pragae*, iB, 10, pp. 139–170, 1938. [Czech summary.]

Lists are given of (*a*) the species of fungi described and figured by Corda, including a large number represented by type specimens at the National Museum of Prague, (*b*) species designated by new names in Corda's herbarium but not described or figured and in some cases renamed in his published works, and (*c*) authentic specimens of fungi furnished by various mycologists, chiefly Berkeley, Léveillé, and Montagne. The material in question, comprising some 400 specimens, was brought to light in the course of the author's rearrangement of the Museum herbarium in 1932.

Hopkins (J. C. F.) & Mossop (M. C.). **The spraying of Tobacco seed beds and control of rosette disease.**—*Rhod. agric. J.*, xxxv, 10, pp. 760–764, 2 figs., 1938.

During the last twelve months, tobacco 'rosette' [*R.A.M.*, xviii, p. 278] has become widely prevalent in Rhodesia. Transmission of the virus from diseased to healthy plants has been proved to take place by means of the aphid *Myzus persicae*, which is a much more efficient carrier of the disease than whitefly [*Bemisia* sp.] is of leaf curl.

Rosette has been observed on several occasions in seed-beds in the Lomagundi district. The first symptom on young seedlings is a slight downward curling of the tip of one of the youngest leaves just emerged from the bud. The plant continues growth, and the affected leaf puckers up. Subsequent leaves become similarly affected, the distortion becomes more marked, and finally a rosette of twisted, puckered leaves develops in the crown, and growth becomes arrested.

In addition to spraying every five days with Bordeaux-lead arsenate-nicotine mixture (8–1½–16 fluid oz. 40 per cent. extract–50 plus a spreader), growers are strongly advised to remove and destroy immediately all affected seedlings, to exclude all tobacco re-growth from fallow lands, to cease growing tomatoes, potatoes, and *Zinnia* in the vicinity of tobacco, as it appears that these are hosts of the virus, and to eradicate weed hosts, especially *Solanum nigrum* and *Nicandra physaloides*, from the seed-bed sites. All residual plants must be destroyed as soon as each bed is finished with.

Price (W. C.) & Wyckoff (R. W. G.). **Ultracentrifugation of juices from plants affected by Tobacco necrosis.**—*Phytopathology*, xxix, 1, pp. 83–94, 2 figs., 1939.

The juice of Turkish tobacco plants infected by the tobacco necrosis virus [*R.A.M.*, xviii, p. 211] yielded on quantity ultracentrifugation a characteristic macromolecular substance, purified solutions of which sediment with a single sharp boundary and a constant of $S_{20°} = ca\ 112 \times 10^{-13}$ cm. sec.$^{-1}$ dynes^{-1}.

Substances with the same sedimentation constants have been isolated from cucumber, cowpea, and *Nicotiana glutinosa* plants infected by the tobacco necrosis virus. The amounts of macromolecular substances obtained are roughly proportional to the infectiveness of the host juices. The infectious juices from diseased cucumber and cowpea plants contain lighter components probably identical with the pigmented macromolecular substances occurring in appreciable quantities in healthy representatives of the same species. Small amounts of similar non-infectious macromolecules have also been found in healthy Turkish tobacco and *Nicotiana glutinosa* juices. All these substances have the same sedimentation constant, viz., $S_{20°} = ca\ 75 \times 10^{-13}$ cm. sec.$^{-1}$ dynes^{-1}, except those in cowpea, for which the corresponding formula is $S_{20°} = 51 \times 10^{-13}$.

Johnson (J.). **Plant virus inhibitors produced by micro-organisms.**—*Science*, N.S., lxxxviii, 2293, pp. 552–553, 1938.

Laboratory studies showed that *Aerobacter aerogenes* and *Aspergillus niger* in culture produced a substance or substances which, when added to an extract of tobacco mosaic, immediately inhibited the infectivity of the virus. It was not toxic, however, to bacterial, fungal, or higher plant cultures, and in this respect resembles charcoal, *Phytolacca* juice, and trypsin. The inactivation of the virus being instantaneous, it is apparently not due to decomposition or digestion. The substance was appreciably concentrated by evaporation of the medium, the inactivator partly withstanding 100° C. for some hours. In a 0·1 per cent. aqueous solution of the dried broth culture, the product was normally active and retained most of its activity at 0·1 per cent. concentration. A normal concentration completely inactivated an equal volume of undiluted extract of ordinary tobacco mosaic, and was equally effective on several other plant viruses. The inactivator passed bacterial-proof filters with markedly reduced potency. Activity was retained for months in the original culture, a heat-sterilized culture, and in a state of desiccation. The substance also withstood high concentrations of alcohol, chloroform, mercuric chloride, and charcoal. It differed markedly from the *Phytolacca* juice and trypsin inhibitors in its ability to tolerate higher temperatures, as well as in other respects.

Goldin (M. I.). **I. Tobacco-mosaic virus as influenced by micro-organisms. II. Adsorption of Tobacco-mosaic virus by micro-organisms.**—*C.R. Acad. Sci. U.S.S.R.*, N.S., xx, 9, pp. 735–740, 1938.

The first of these two papers on the relations between viruses and micro-organisms in culture and under natural conditions describes a

series of experiments in which both the non-sterile tobacco mosaic virus [*R.A.M.*, xvii, p. 809] in tomato juice and the sterile filtrate (filtered through L3 candles) were more rapidly inactivated (at 25° C.) under aerobic than under anaerobic conditions. The sterile filtrate of the virus was found to lose its activity almost completely on the second day in the presence of a pure culture of *Torula kefiri* under aerobic conditions, while it remained active for over six months in a culture of *B[acillus] mycoides*, *B[acterium] coli comm[unis]* occupying an intermediate place. Regular records of the hydrogen-ion concentration showed that the effect of the organisms on the virus was not conditioned by changes of P_H.

In experiments on the adsorption of tobacco mosaic virus by micro-organisms, described in the second paper, samples of juice of tomato infected with either ordinary tobacco mosaic virus or with the crystalline virus, both previously filtered through L3 candles, were added to cultures of micro-organisms with different P_H values, flasks without micro-organisms serving as controls. All flasks were kept for two hours in a thermostat at 37° and then for 24 hours in a refrigerator, after which all preparations were centrifuged three or four times for five minutes at a speed of 1,000 r.p.m., the supernatant liquid decanted each time, and finally the virus content of the sediment and of the last washing liquid was determined by inoculation on *Nicotiana glutinosa*. The results showed that the virus was adsorbed by *Bacillus mycoides* and *Schizosaccharomyces*, particularly in an acid medium.

Blue mold (downy mildew) of Tobacco and its control.—*Bull. Va agric. Exp. Sta.* 318, 18 pp., 8 figs., 1938.

A popular account is given of the economic importance, symptoms, and the causal fungus of tobacco downy mildew [*Peronospora tabacina*: *R.A.M.*, xvii, p. 275; xviii, p. 63] in the United States, together with a discussion of the factors favouring the disease [ibid., xvi, p. 64] and methods of control. The use of narrow seed-beds (not more than 2 yds. wide) is strongly recommended, partly because they facilitate control operations. Detailed practical directions are given for control by fumigation with benzene or paradichlorbenzene [ibid., xvii, p. 844] and spraying with red copper oxide, emulsified cottonseed oil, and water [ibid., xvii, p. 275]. Experience to date indicates that 1 oz. paradichlorbenzene crystals is sufficient for each 4 or 5 sq. yds. of bed area, but if the disease is already present twice or three times this amount should be used for two or three successive nights. When the disease has been checked the smaller dosage of crystals should be applied and the supply replenished every night. The cloth for covering the beds during fumigation should be heavy sheets, with 50 to 60 threads each way per in. The red copper oxide spray now recommended comprises ½ lb. red copper oxide, ½ gal. cottonseed oil, and either 1 qt. lethane spreader, ½ to ¾ pt. orvus, or ½ to ¾ lb. dreft in 50 gals. water. [This bulletin is reprinted as *Circ. Coll. Agric. Ky.* 329, 18 pp., 8 figs., 1939.]

Pinckard (J. A.) & Shaw (L.). **Downy mildew infection of flue-cured Tobacco in the field.**—*Phytopathology*, xxix, 1, pp. 79–83, 4 figs., 1939.

Two distinct types of infection by downy mildew (*Peronospora*

tabacina) were observed on flue-cured tobacco [see preceding abstract] in the Old Belt of North Carolina and Virginia in 1938. One was characterized on Yellow Mammoth by aggregated yellow spots, individually resembling those caused by *Bacterium angulatum* and collectively producing a blotched appearance. In some cases the small lesions composing the blotches coalesced into large necrotic areas, 10 to 20 mm. in diameter. Sporulation was not observed on lesions of this kind, which persisted almost unchanged until early July and apparently represent a more or less static phase of the disease. The second type of infection consisted of ill-defined chlorotic areas of varying size and number per leaf, which eventually developed into large, well-marked necrotic lesions, frequently coalescing to involve most of the leaf surface; finally they disintegrated and fell out, leaving ragged holes. Sporulation occurred on these lesions, especially after necrosis had set in. Favourable conditions for dissemination, infection, and the development of mildew in the field were no doubt provided by a rainy spell during the latter half of May. Viable sporangia were repeatedly collected from seed-beds, which probably constitute foci of inoculum for the field and should therefore be destroyed as soon as possible after the crop has been transplanted.

Jewett (Frances L.). **Relation of soil temperature and nutrition to the resistance of Tobacco to Thielavia basicola.**—*Bot. Gaz.*, c, 2, pp. 276–297, 37 figs., 1938.

When Ordinary White Burley (susceptible), Resistant White Burley (resistant), Connecticut Havana 38 (resistant), Havana 142 (very resistant), and Xanthia (extremely resistant) tobacco plants were grown in the greenhouse in soil temperature tanks containing nutrient solution with and without nitrate nitrogen at soil temperatures of 18° to 20° and 28° to 30° C. and were inoculated with pure cultures of the black root rot fungus, *Thielavia* [*Thielaviopsis*] *basicola*: [*R.A.M.*, xvii, p. 774], the susceptibility or resistance of each variety remained unaffected at any given temperature by the presence or absence of nitrogen in the nutrient. Evidence is adduced that low soil temperature favours infection and varieties resistant at high temperatures are rendered susceptible at low ones. The development of resistant varieties, however, remains the best practical method of control.

Periderm formation in control plants was not correlated with resistance and there was no evidence of periderm formation in advance of the fungus or round lesions produced by it. Response to fungal injury was similar to reaction to mechanical wounding. Callus formation in infected roots and stems appeared to be regenerative rather than defensive. It is concluded that the mechanism of resistance is probably due to chemical factors rather than to anatomical modifications.

McWhorter (F. P.) & Milbrath (J. A.). **The tipblight disease of Tomato.**—*Circ. Ore. agric. Exp. Sta.* 128, 14 pp., 4 figs., 1938.

The tomato virus disease known in southern Oregon as tip blight [*R.A.M.*, xv, p. 182] infected from a trace to about 20 per cent. of the crop during the years 1932 to 1937 and caused a directly proportional loss of yield, since infected plants either die or yield only unmarketable

fruits. Individual growers may sustain much heavier losses, even to the complete destruction of the crop. The disease appears in the latter part of June but does not become widely prevalent until July or August.

The most conspicuous symptom in the Indiana Canner variety is marked blighting and blackening of the terminal shoots. The dead tips stand perpendicularly above the living foliage, and show black patches and brown streaks that subsequently turn silver-grey. The stems are hollow, the pith in the region of the tip being arranged in scattered patches, with air-pockets in between. The leaves of affected shoots show a few large or numerous small, black, necrotic spots on both surfaces; these may enlarge and coalesce.

Six to eight days after the inoculation of a leaf, one or more lesions appear at the point of inoculation; two to five days later, black streaks appear on the stem at the base of the inoculated leaf. As the virus spreads up the stem, minute black spots appear on both surfaces of the leaves, enlarging in a day or two into characteristic lesions. Small plants succumb within about 14 days of inoculation. If infection develops while the flowers are opening, lesions may occur on the fruit spur and calyx, causing the flowers only, or the whole fruit spur to become blighted. The development of small fruits is arrested, and irregular brown spots appear on the green surfaces. Fruits more than 1 in. in diameter do not continue to enlarge, but ripen abnormally, turning soft, and showing yellow, orange, and red blotches and rings. The larger fruits ripen unevenly. The underground parts are invaded by saprophytes.

Apparently healthy leaves immediately below infected ones on a diseased shoot, if floated for about 20 hours in water, develop a characteristic greenish-black speckle if tip blight is present. This test may be used under field conditions to distinguish tip blight from bacterial canker (*Bacterium* [*Aplanobacter*] *michiganense*).

Transmission of the disease was effected by grafting and by the carborundum method, provided the infectious juice was taken from recently infected plants and rubbed into vigorous ones. *Thrips tabaci* was commonly present in the affected fields, and when this insect was transferred from naturally infected plants to 31 healthy tomato plants, 13 of the latter developed lesions on the exposed leaves, and five of these plants subsequently developed systemic symptoms.

Inoculations of local weeds with juice from diseased tomato plants gave 100 per cent. positive results with *Solanum nigrum* and *Lactuca scariola*, and 19 out of 35 positive results on *Datura stramonium*, a number of other wild hosts responding by the production of local lesions only.

The removal of all diseased tomato plants early in the season and of all weeds is likely to reduce loss. Localities known to favour the disease should not be used for tomato-growing. Progress has already been made in the development of resistant varieties.

Horsfall (J. G.), Magie (R. O.), & Suit (R. F.). **Bordeaux injury to Tomatoes and its effect on ripening.**—*Tech. Bull. N.Y. St. agric. Exp. Sta.* 251, 39 pp., 5 figs., 11 graphs, 1938.

To investigate the causes of the failure of Bordeaux mixture to give

increased yields of tomatoes commensurate with the degree of control obtained over leaf diseases [*R.A.M.*, xvi, p. 714; xvii, p. 712], field and greenhouse tests were carried out in New York from 1929 to 1938, inclusive, in which tomato plants were sprayed with Bordeaux mixture (4–4–50) and (4–2–50), lime alone, and insolubilized copper compounds without lime, and measurements made of growth, blossoming, and fruiting.

The results showed that Bordeaux mixture produced both hyperplastic and hypoplastic symptoms. The former consisted of dark green foliage, stimulation of adventitious buds, accelerated transpiration [ibid., xvi, p. 844], larger fruits, smaller growth cracks, russeting, and an increased tendency of the pedicel to adhere to the fruit when picked. The latter appeared as hardening of the leaves, plant dwarfing, leaf and fruit deformation, reduced blossom-bud development, defloration, and reduced yield.

The darker green of the sprayed foliage is attributed to an optical effect and to copper stimulation, the stimulation of adventitious buds to the killing of meristems, and the larger fruits to their smaller number. Leaf hardening took the form of turgidity due, apparently, to the effects of the copper, and of woodiness due, apparently, to those of calcium. The plant dwarfing is attributed to accelerated transpiration, plugging of the stomata with resultant reduced photosynthesis, and hardening caused by the lime, which impeded cell expansion. The reduction in blossom-bud development was in proportion to the dwarfing, and, with the defloration, resulting apparently from direct copper toxicity, accelerated transpiration, and calcium hardening, was the cause of the reduction in yield.

Much of the injury appeared to be related to the alkalinity of the mixture, similar damage being occasionally produced by acid, and not by neutral, sprays.

Dorokhov [Dorokhoff] (L. M.). **Alteration of physiological processes in Tomato under the influence of Cladosporium fulvum Cke.**— *C.R. Acad. Sci. U.R.S.S.*, N.S., xxi, 1–2, pp. 85–88, 1938.

In experiments carried out in Moscow in 1936, seeds of the Sparks Gribivsky variety of tomato germinated quite normally in Richards's solution diluted to 25 per cent. strength, while only 18 to 40 per cent. germinated in a 25 per cent. solution of the culture filtrate of *Cladosporium fulvum* [*R.A.M.*, xviii, p. 142] grown on Richards's medium. No germination at all occurred in concentrations of the filtrate exceeding 25 per cent. Seeds inhibited by exposure to a culture filtrate germinated after 24 hours when washed and transferred to Petri dishes.

In further experiments the majority of tomato plants grown on a 1, 5, 10, or 25 per cent. filtrate from *C. fulvum* cultures, or of plants grown from seeds kept for 10 to 15 days in a 50 to 75 per cent. culture filtrate prior to germination, perished when transferred to Knop's nutrient solution, and the surviving plants had under-developed yellow leaves. When tomato plants were grown on Knop's nutrient solutions to which 5, 10, or 25 per cent. concentrations of the culture filtrate were added, the 25 per cent. filtrate poisoned the plants, which died in 30 to 35 days, while with the 10 and 5 per cent. filtrates the plants

survived, but showed yellowing and drying up of young leaves or yellowing only, respectively. It is concluded from these results that *C. fulvum* excretes into the nutrient medium toxins which suppress the development of the seed embryo and, when introduced into the plant, cause a partial or total poisoning of the host cells and break up the chlorophyll. The photosynthesis and still more the respiration of tomato leaves were found to be lowered by infection with *C. fulvum*, whereas the transpiration of infected leaves increased considerably.

BERNAL (J. D.), FANKUCHEN (I.), & RILEY (D. P.). **Structure of the crystals of Tomato bushy stunt virus preparations.**—*Nature, Lond.*, cxlii, 3607, p. 1075, 1938.

X-ray examination of crystals of protein material obtained from tomato bushy stunt [*R.A.M.*, xviii, p. 143] showed them to be isotropic rhombic dodecahedra of average diameter (0·01 mm.). Data obtained from photographs made with a monochromatic beam of copper $K\alpha$ radiation at 40 cm. indicated a particle diameter of 340 Å or a radius of 17mμ. The density of the crystals in solution was 1·286, so that, assuming two particles per cell, the wet molecular weight is 24,000,000. When dried and again wetted the crystals shrank and swelled reversibly, shrinking amounting to 80 per cent. of the wet dimensions. An X-ray photograph of a crystal dried over phosphorus pentoxide showed almost precisely the same shrinkage. Assuming that the density of 1·35 computed by McFarlane and Kekwick is that of the dry crystals, the molecular weight would be 12,800,000, as against the figure of 8,800,000 found by the same workers by the centrifuge method [loc. cit.], a discrepancy possibly resulting from some of the water in the crystal being held zeolitically and lost without further shrinkage.

ARRUDA (S. C.). **A septoriose ou mancha da folha do Tomateiro.** [Septoriosis or leaf spot of Tomatoes.]—*Biologico*, iv, 12, pp. 389–392, 1 fig., 1938.

This is a popular account of the leaf spot of tomato (*Septoria lycopersici*) [*R.A.M.*, xvii, p. 140] and its control in Brazil, where the disease is present wherever the tomato is grown, and is especially destructive on soils cropped with tomatoes for several years consecutively.

GUBA (E. F.). **A red forcing Tomato resistant to Cladosporium leaf mold.**—Abs. in *Phytopathology*, xxix, 1, p. 9, 1939.

A red tomato combining resistance to leaf mould (*Cladosporium fulvum*) with other desirable commercial qualities has been developed for greenhouse culture at Waltham, Massachusetts [*R.A.M.*, xviii, p. 142] from original hybrids between the resistant *Lycopersicum pimpinellifolium* and Success, Belmont, and Break o' Day, and from subsequent crosses of progeny of these hybrids, pure lined for resistance, with Waltham Forcing. The new selection from the latest hybrids is named Bay State.

GUBA (E. F.) & RACKEMANN (F. M.). **Species of Cladosporium on Tomato and the allergic response in Man as an aid to their identification.**—*Mycologia*, xxx, 6, pp. 625–634, 1 fig., 1938.

From a review of the relevant literature the authors conclude that

Cladosporium fulvum var. *violaceum* Plowr. and *C. solani* McAlpine, both recorded as causing leaf mould of tomatoes, are synonymous with *C. fulvum* [R.A.M., xviii, p. 142]. Accounts of decay of tomato fruits associated with these fungi are due to erroneous identifications, and *C. lycopersici*, to which is frequently attributed transit and other decays of tomatoes, appears to be the same as *C. herbarum*. The latter would also seem to be the better name for *C. lycoperdinum*, reported by Ellis on tomato fruits. Intracutaneous injections of extracts of *C. fulvum* and several other *C.* species into individuals susceptible to asthma caused by *C. fulvum* resulted in markedly varied reactions with the species tested; the differences were specially noticeable between the reactions to *C. fulvum* from greenhouse tomato leaves and to *C. herbarum* from rotted tomatoes and peppers [? *Capsicum annuum*]. This biologic test appears to be a new method by which closely related fungi may be differentiated from one another with considerable certainty.

Strong (F. C.). **Some important shade tree diseases of the Mid-West.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf., 1938*, pp. 106–118, 7 figs., 1938.

In this paper the author discusses the more important parasitic and non-parasitic diseases of shade trees observed during the past ten years in the mid-western States.

For the control of the increasingly important cedar-hawthorn rusts (*Gymnosporangium* spp.) it is recommended to plant junipers at least half-a-mile away from crab apples and hawthorn in order to prevent infection, to eliminate all trees of one of the host groups from the particular area entirely, or to use resistant varieties. A severe and general epidemic of the leaf spot and twig blight [*Gnomonia veneta*] of sycamore [*Platanus*] and white oak [*Quercus* (?) *alba*] occurred throughout the north-central States in 1930, but generally leaf diseases of trees were only locally severe. Heavy infection by leaf spot [*G. leptostyla*: *R.A.M.*, xii, p. 251] commonly hastened the leaf fall of walnuts by up to a fortnight. Elm leaf spot [*G. ulmea*: ibid., xviii, p. 11] appeared on susceptible individual trees year after year. Apart from these, many other leaf diseases of minor importance were observed. The major problem was constituted by the wilt diseases of elms and maples [cf. ibid., xviii, p. 281]; about 34 per cent. of the elm trees examined showed the presence of some of the wilt organisms, the remainder being apparently affected by adverse conditions of weather and soil. Prompt removal and burning of affected parts of elm trees infected by one of the wilt-producing fungi and liberal manuring and watering of the trees is urged. So far *Verticillium* was found to be the only parasite, apart from the root fungi, causing definite wilt in maples, and its presence is almost always indicated by the appearance of dark green streaks in the wood. *Sphaeropsis* canker of elm [cf. ibid., xi, p. 212] was quite abundant in Wisconsin but rare in Michigan; *Nectria* canker was more common than any other canker disease except that due to *Cytospora*, which was prevalent, particularly on poplar [cf. ibid., xiii, p. 411] and willow [ibid., xvii, p. 567, 654]. Chestnut blight [*Endothia parasitica*: ibid., xvii, p. 355] was observed to be spreading westwards, killing American chestnuts planted west and north of the native range of this

tree. Blighted trees should be cut down and burned as soon as possible, but in the case of other tree cankers individual surgical treatment is advised on street and park trees and cutting down and burning of affected trees in forest and wooded areas.

TROTTER (A.). **Ricerche intorno agli ammuffimenti e ad altre alterazioni delle Castagne.** [Researches on moulds and other spoilage of Chestnuts.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), vii, pp. 1–40, 2 pl. (1 col.), 14 figs., 1938.

In this paper the author discusses very fully the different types of spoilage affecting Italian chestnuts destined for export to America [*R.A.M.*, xvii, p. 356] and gives full details of three years' investigations carried out in the laboratory, storehouses, and shops in Italy into the different types of injury (insects, external and internal moulds, and fermentative processes set up by bacteria and Blastomycetes).

The kind of internal moulding found in chestnuts is apt to vary from year to year with environmental conditions, though *Penicillium crustaceum* is the chief agent of internal mould every year. In 1934, internal mould due to *Rhacodiella castaneae* [ibid., xv, p. 616] and *Trichothecium roseum* [ibid., x, p. 697] was abundantly present in the chestnuts examined, whereas in 1935 neither fungus was found. In 1936 the former was again widely prevalent, affecting about 10 per cent. of the chestnuts examined, but the chief cause of mould (even in nuts on the trees) was *P. crustaceum*. Disinfection with 'cloramina' and 'euclorina' [loc. cit.] gave excellent results, especially at a concentration of 1 in 10,000, but freedom from spoilage in exported nuts depends primarily on the careful selection of sound clean nuts in the first place.

CRISTINZIO (M.). **Il male dell' inchiostro del Castagno nella Campania.** [Chestnut ink disease in Campania.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), vii, pp. 64–71, 2 pl., 1938.

The author records the presence of chestnut ink disease (*Phytophthora cambivora*) [*R.A.M.*, xviii, p. 70] in several different localities in the province of Campania, where the disease had not been observed until recently, but where, in the last few years, production has progressively declined as a result of infection. The only method of control likely to give satisfactory results lies in replacing the old varieties by the Japanese chestnut (*Castanea crenata*). The regions worst affected in Italy are Tuscany, Piedmont, Lazio, and Liguria. In many districts of the Campania and also in Avellino, infection of chestnuts by *Sphaerella* [*Mycosphaerella*] *maculiformis* [ibid., ix, p. 204], favoured by the prevailing weather conditions, reached epidemic proportions in 1937. A few trees in the Campania were attacked by *Coryneum perniciosum* [ibid., vi, p. 6].

JENKINS (ANNA E.). **An early occurrence of Taphrina sacchari in Wisconsin.**—*Mycologia*, xxx, 6, pp. 689–691, 1 fig., 1938.

The author states that in the Herbarium of the University of Wisconsin she recently discovered a specimen labelled *Gloeosporium*

saccharinum, which is identical in appearance with *Taphrina sacchari* [*R.A.M.*, xviii, p. 71]. This specimen is dated June, 1904, and was collected at Madison, Wisconsin. It is the earliest collection of this fungus yet known, and the only record from Wisconsin.

Blaisdell (Dorothy J.). **Decay of hardwoods by Ustulina vulgaris and other Ascomycetes.**—Abs. in *Phytopathology*, xxix, 1, p. 2, 1939.

Of recent years *Ustulina vulgaris* [*R.A.M.*, xviii, p. 1] has repeatedly been isolated from butt rot of hardwoods in the United States. When grown on autoclaved and hot water-dipped sapwood blocks of green sugar maple [*Acer saccharinum*], beech, and black oak [*Quercus nigra*] in Kolle flasks at room temperature, the fungus from maple was found to have caused after six months a loss of 18 per cent. oven-dry weight in beech, 11 per cent. in maple, and 26 per cent. in black oak. The typical white rot with black zone lines was induced. Considerable decay was further caused under similar conditions by *Xylaria polymorpha* [ibid., xvii, p. 357], *X. fusca*, *Daldinia concentrica* [ibid., xiv, p. 494], *Nummularia atropunctata*, *Hypoxylon* sp., and *Strumella corynoidea* [ibid., xviii, p. 280]. The inoculation of living oak with *U. vulgaris* resulted in typical decay of the heartwood in about a year.

Bondartzeff (A. S.) & Lyubarski (L. V.). Гниль Монгольского Дуба, вызванная трутовиком **Polyporus (Spongipellis) litschaueri (Lohw.) A. Bond.** [Decay of Mongolian Oak caused by *Polyporus* (*Spongipellis*) *litschaueri* (Lohw.) A. Bond.]—*Sovetsk. Bot.*, *1938*, 3, pp. 121–125, 2 figs., 1938.

The authors state that careful re-examination of the herbarium material at the Botanical Institute of the Academy of Sciences, Leningrad, on which Bresadola based his identification of the three species *Polyporus obtusus*, *P. unicolor*, and *P. schulzeri* with one another, showed that this material consists of three morphologically distinct species [the characters of which are tabulated]. The binomials *P. schulzeri* and *P.* [*Daedalea*] *unicolor* [see above, p. 335] are maintained for two of these forms, but the third is identical with Lohwag's description from Austria of *Spongipellis litschaueri* (*Arch. Protistenk.*, lxxv, 3, pp. 297–312, 1931). To judge from the herbarium material studied, this fungus is the only one of the three species that has so far been recorded in the U.S.S.R. In European Russia its sporophores are occasionally found on living broad-leaved trees, chiefly the oak, elm, maple [*Acer*], and poplar in the Ukraine, certain central provinces, and north Caucasus, and on account of their great variability in size, shape, appearance, and certain morphological details, Bondartzeff transfers the fungus to the genus *Polyporus* as *P. litschaueri* n. comb. [with a revised Russian diagnosis: cf. *R.A.M.*, xv, p. 63]. In the Russian Far East it is common on the Japanese elm (*Ulmus propinqua*) and causes very considerable damage to the Mongolian oak (*Quercus mongolica*), affecting from 61·3 to 89·9 per cent. of the trees in certain districts. On this host it produces a white heart rot, frequently extending throughout the trunk and rendering the timber useless for industrial purposes.

Fréquence du champignon provoquant la pourriture 'rouge tendre' du Sapin dans le canton de Rhodes extérieures. [Incidence of the fungus causing 'pale red' rot of Firs in the canton of Outer Rhodes.]—*J. for. suisse*, xc, 1, pp. 15–16, 1939.

It is stated in the report on silvicultural administration in the demi-canton of Outer Rhodes (Appenzell) for 1937–8 that pale red rot (*Trametes radiciperda*) [*Fomes annosus*] is most prevalent among firs [*Abies*] in light, sandy sites with a south-west exposure, and in damp localities, especially where livestock frequent the plantations and damage the aerial roots. In pure stands the incidence of infection may amount to 50 per cent., whereas in mixed plantings, especially with hardwoods, the disease is negligible or absent, the same being true of populations arising spontaneously from seed. Infection commences to appear on trees of 15 to 20 years old.

Rohmeder (E.). **Wundschutz an verletzten Fichten.** [Wound protection on injured Spruces.]—*Forstwiss. Zbl.*, lxi, 1, pp. 17–27, 3 figs., 1939.

A detailed account is given of a series of experiments carried out at Grafrath, Bavaria, from 1936 to 1938 to determine the value of various preservatives in the protection of 53-year-old spruces, injured in felling, transport, or in other ways, against the entry of wound fungi, and to settle certain points in connexion with the time and method of treatment. It was found that the ingress of such organisms, which included *Stereum sanguinolentum* [*R.A.M.*, xviii, p. 75] and a species of *Lenzites*, could be largely prevented by the application, as soon as possible after the infliction of the damage, of deacidified mineral coal tar or a proprietary tar-like substance (Farbenindustrie) not yet on the market.

Gäumann (E.). **Der Einfluss der Fällungszeit auf die Dauerhaftigkeit des Fichten-, Tannen- und Buchenholzes.** [The influence of the felling time on the durability of Spruce, Fir, and Beech wood.]—Reprinted from *Schweiz. Z. Forstw.*, lxxxix, 7–8, 21 pp., 16 graphs, 1938.

This is a résumé of the writer's studies on the influence of the period of felling on fungal decay of spruce, fir [*Abies*], and beech woods in Switzerland, notices of which have already appeared from other sources [*R.A.M.*, xvii, p. 426].

Ten Houten (J. G.). **Kiemplantenziekten van coniferen.** [Conifer seedling diseases.]—Thesis, Univ. of Utrecht, 125 pp., 5 pl., 1 fig., 1939. [English summary.]

This comprehensive, fully tabulated study of conifer seedling diseases, which are stated to be responsible for heavy losses (up to more than 60 per cent.) in Dutch nurseries, opens with a description of the different types of damping-off as defined by C. Hartley (*Bull. U.S. Dep. Agric.* 934, 1921), followed by a résumé of the pertinent European and American literature.

Inoculation experiments were carried out by van Luijk's method [*R.A.M.*, xviii, p. 47] with a number of the fungi isolated from diseased seedlings on Scots and Austrian pines (*Pinus sylvestris* and *P. nigra* var. *austriaca*). The seeds, sterilized by half-an-hour's immersion in 0·25 per cent. ceresan, were grown in glass tubes on (*a*) Knop's nutrient solution and (*b*) autoclaved soil. The most destructive pathogens,

causing up to 100 per cent. losses, were found to be *Rhizoctonia* [*Corticium*] *solani* from *P. sylvestris* and *P. nigra* var. *austriaca*, *Pythium de Baryanum* from *P. sylvestris*, *Fusarium oxysporum* from *P. sylvestris*, *P. nigra* var. *austriaca*, and *Abies grandis*, *F. solani* from *P. sylvestris*, *P. nigra* var. *austriaca* (including seed), and *Pseudotsuga douglasii* [*P. taxifolia*], *F. scirpi* from *Pinus nigra* var. *austriaca*, *F. orthoceras* from *Pseudotsuga taxifolia*, *Cylindrocarpon didymum* [ibid., xvi, pp. 504, 513], *C. radicicola* [ibid., xvii, p. 116; xviii, p. 154], and *Coniothyrium pityophilum* from *Pinus sylvestris* and *P. nigra* var. *austriaca*, *Naemosphaera rostellata* from *P. sylvestris*, *Botrytis cinerea* from *P. sylvestris*, *P. nigra* var. *austriaca*, *Larix leptolepis*, *Pseudotsuga taxifolia*, and *A. grandis*, and *Botryodiplodia theobromae* from *Pinus merkusii* seed. A moderate degree of pathogenicity was further demonstrated in trials with *Pythium* (?) *torulosum* [ibid., xiv, p. 240] from *Pinus sylvestris* and *A. grandis*, *Gliocladium penicillioides* [ibid., xv, p. 823] from *P. nigra* var. *austriaca*, *Leptothyrium* sp. from *Larix leptolepis*, *Phoma dunorum* n.sp. and *Pleospora herbarum* from *Pinus nigra* var. *austriaca*, *Alternaria tenuis* from *P. nigra* var. *austriaca*, *P. sylvestris* (seed), *L. leptolepis*, and *Pseudotsuga taxifolia*, *Stemphylium asperulum* from *P. nigra* var. *austriaca*, and *Trichoderma lignorum* from *P. sylvestris*, *P. nigra* var. *austriaca* (including seed in both species), *L. leptolepis*, and *Abies grandis* (parasitic in autoclaved forest soil only) [ibid., xvii, pp. 172, 455, 623, 838; xviii, p. 193].

Phoma dunorum [with a Latin diagnosis] is characterized by obtusely conoid, often concrescent, uni- to pluriostiolate, brownish-grey pycnidia, 0·28 by 0·22 mm., and ovoid, obtuse spores, 3·7 to 4 by 2 to 2·3 μ. *Phytophthora fagi* [ibid., xiii, p. 605], included in the tests as an established agent of damping-off though not found in Holland on diseased conifers, proved to be mildly pathogenic. *Pythium artotrogus* [ibid., xi, pp. 91, 331] was very weakly parasitic on *Pseudotsuga taxifolia* and *Pinus nigra* var. *austriaca* but failed to infect *P. sylvestris*. Generally speaking, the more virulent fungi were isolated from the root system and the less severely infectious from the cotyledons and stems.

In some cases the medium on which the fungi were grown before their introduction into the soil exerted a considerable influence on their pathogenicity, presumably by stimulating the production of toxins. For instance, cultures of *F. oxysporum*, *Corticium solani*, and *T. lignorum* from malt salep agar were much more active in this respect than those from Knop's solution, whereas *Pythium de Baryanum* proved to be virtually independent of its substratum. *C. solani* caused much heavier losses to *Pinus austriaca* var. *nigra* seedlings on garden, heath, dune, and loess soils than on acid (P_H 4·5) pine forest soils, in which the damage was practically negligible. Similar results were obtained with *Pythium de Baryanum*. *T. lignorum* was shown to inhibit the parasitic development of *F. oxysporum* and to some extent also that of *C. solani* in sterilized forest soil in pot experiments.

Data regarding the relation of sowing time to the incidence of damping-off were obtained by K. Vik's method (*Landbouwk. Tijdschr., Wageningen*, xlvii, p. 570, 1935), involving the use of 9 or 25 plots, each 80×80 cm., arranged in a square. The best results with *Pinus nigra* var. *austriaca* were given by the March and April (1938) sowings, in

which the numbers of seedlings lost through damping-off on 23rd September were 387 and 133, respectively, compared with 479, 524, and 543, respectively, for the December, January, and February sowings. The same method was used for experiments in the control of the disease on *P. nigra* var. *austriaca* and *Pseudotsuga taxifolia* by various soil treatments, of which covering the seeds with heath sand and gravel was most effective in the case of the former (66 seedlings lost through damping-off after five months compared with 108, 168, 701, and 352 in the controls and plots treated in three other ways, respectively), whereas the latter responded more favourably to 1 per cent. sulphuric acid treatment of the beds at the rate of 5 l. per sq. m. (995 healthy seedlings compared with 623, 504, 198, and 956 for the controls, mixing with heath sand, growing the beds with 5 cm. heath sand, and covering the seeds with heath sand and gravel, respectively). Preliminary trials in the control of damping-off by dusting with red copper oxide (25 to 50 gm. per kg. seed) also gave promising results.

MARTIN (J. F.). **Some economic aspects of White Pine blister rust control.**—*J. For.*, xxvi, 10, pp. 986–996, 2 figs., 1 graph, 1938.

The author gives an historical account of the control of the blister rust (*Cronartium ribicola*) [*R.A.M.*, xviii, p. 216] of northern and western white and sugar pines (*Pinus strobus*, *P. monticola*, and *P. lambertiana*, respectively) in the United States. The control area covers an aggregate surface of some 30,000,000 acres, over 20,000,000 of which (67 per cent.) had been initially cleared of *Ribes* by the end of 1937. The methods of eradication are briefly described, including a chemical method which involves cutting off the bushes at or below soil-level with a Pulaski or long-handled pruning shears and the application of chemicals to the crown, 2 to 3 fluid oz. Diesel oil or saturated ammonium thiocyanate giving the best results on *R. roezli* on dry soil, while $\frac{1}{4}$ to 2 oz. dry ammonium thiocyanate or 1 to 2 oz. sodium chlorate-borax mixture (1:5) have proved effective on *R. viscosissimum*, growing on relatively moist ground in Idaho. Mechanical methods are also in use in the western States, principally represented by the 'bulldozer', a caterpillar tractor fitted with a steel rake to clear the land of mixed *Ribes* and brush.

The efficacy of *Ribes* extirpation as a control measure was demonstrated in 1934 in protected areas in New Hampshire, New York, Vermont, and Pennsylvania, where only 2·2 per cent. of the total contracted infection for the first time after the work of suppression was performed from 4 to 11 years previously, whereas the corresponding figure for unprotected areas was 39·8 per cent. Numerous other statistics relating to various phases of the campaign are cited, and information is also presented on the methods of surveying the stands for the determination of their value prior to the application of control measures, and on the ecological factors to be considered in the work of *Ribes* eradication.

TOOLE (E. R.). **Relation of incidence of needle disease in Loblolly Pine plantations to certain physical properties of the soil.**—*J. For.*, xxxvii, 1, pp. 13–18, 1939.

A significant difference in the amount of infection by needle diseases

(*Septoria acicola* and *Lophodermium pinastri*) [*R.A.M.*, xvi, p. 218; xvii, pp. 196, 214, 567] was observed in 30 loblolly pine ((*Pinus taeda*) plantations of various ages in the 1931 to 1937 groups in a preliminary analytical study in the Duke Forest [North Carolina]. Infection was most severe in the youngest plantings (two to three years old), but no correlation was observed between the amount of disease and height growth or the seven physical properties of the soil investigated.

Davidson (R. W.), Campbell (W. A.), & Blaisdell (Dorothy J.). **Differentiation of wood-decaying fungi by their reaction on gallic or tannic acid medium.**—*J. agric. Res.*, lvii, 9, pp. 683–695, 3 figs., 1938.

An account is given of investigations in which the authors tested for oxidases by Bavendamm's gallic or tannic acid method [*R.A.M.*, viii, p. 281; xvii, p. 424; xviii, p. 284] 210 species of wood-decaying fungi, representing several families and numerous genera, mostly of the Hymenomycetes. The results showed that 156, or 96 per cent., of the species associated with white rots gave positive reactions, as well as nine fungi, the rots caused by which were not known. *Stereum subpileatum*, associated with a white pocket rot similar to that caused by *S. frustulosum* [ibid., xviii, p. 275], for the most part reacted positively on gallic acid but negatively on tannic acid media, the reverse being true of *Schizophyllum commune*, a white rot fungus, which grew well on both kinds of media. With the white rot fungi considerable variations were observed in the intensity of reaction and in the time required for the reaction to occur. Of the species associated with brown carbonizing rots 29 (or 80 per cent.) gave no reaction on either medium. Negative reactions were also given by *Fistulina hepatica* associated with a dark, firm rot, *Stereum frustulosum* with a white pocket rot, and *Polyporus dichrous* with a white rot.

The differences observed in the growth behaviour of the different species on gallic acid and tannic acid media are considered to be of value in the identification of the fungi in culture, and a description is given of ten different growth and reaction groups, the species tested being listed under these groups.

Bavendamm (W.) & Reichelt (H.). **Die Abhängigkeit des Wachstums holzzersetzender Pilze vom Wassergehalt des Nährsubstrates.** [The dependence of the growth of wood-decomposing fungi on the water content of the nutrient medium.]—*Arch. Mikrobiol.*, ix, 5, pp. 486–544, 1 diag., 11 graphs, 1938.

In a highly technical study at the Tharandt [Saxony] Institute of Forest Botany on the moisture requirements of twelve wood-destroying fungi, three groups were differentiated, viz., (1) *Merulius lacrymans*, *Ceratostomella piceae*, *Lenzites sepiaria*, and *L. abietina* [*R.A.M.*, xvii, p. 496], exacting a very high degree of atmospheric humidity (98·2 or 99 per cent. relative vapour tension on malt agar); (2) *Poria vaporaria*, *Trametes radiciperda* [*Fomes annosus*], *Coniophora cerebella* [*C. puteana*] *Pholiota squarrosa* [ibid., xvii, p. 755], and *Clitocybe* [*Armillaria*] *mellea*, with optima ranging from 95·4 to 99, 96·5 to 99, 95·4 to 98·2, 96·5 to 99, and 90·4 to 99 per cent., respectively; and (3) *Stereum pur-*

pureum, *F. fomentarius* [ibid., xviii, p. 215], and *S. frustulosum* [see preceding abstract], the relatively low corresponding figures for which are 96·5, 95·4, and 90·4 to 96·5 per cent., respectively. The last-named organism, a parasite of oak heartwood, is in fact definitely xerophile, being capable of growth at a relative vapour tension below 85·6 per cent. and actually developing slowly at 81·5. Liability to fungal infection may thus commence at a minimum water content of the wood of 15 per cent., or below fibre saturation point. Analogous results were obtained on sawdust or wood blocks of the appropriate hosts of the several fungi concerned.

The practical application of these data is fully discussed.

Findlay (W. P. K.). **Decay of timber and its prevention.**—*Dep. sci. indus. Res., For. Prod. Res. Rec.* (Mycol. Ser. 3), 27, 15 pp., 5 pl., 1938.

After a brief account of the nature of fungi, the conditions influencing fungal growth, and the processes involved in the decay of timber, the author describes the effects of decay on the properties of wood, including discoloration, loss of strength, loss of weight, change of smell, increased absorption of water, the burning properties of decayed wood, increased acidity of the aqueous extract, and susceptibility to attack by boring insects. This section is followed by a discussion of the means of preventing decay in stored timber. Logs from trees highly susceptible to decay should be treated with a preservative as soon as possible after felling if they are not to be removed from the forest at once. Freshly sawn timber may be steamed for a few hours at 200° F., and sawn timbers must be stacked so that the surface at least will rapidly dry. Piles should be erected on brick or concrete piers. Timber in contact with the ground must be creosoted, and all timber-yards kept free from damp, weeds, grass, and decaying wood waste. Timber in service which cannot be kept permanently dry should be treated with a preservative, and valuable woodwork, if decayed, should be exposed for a short time to heat at high humidity in a drying kiln.

Cartwright (K. St. G.) & Findlay (W. P. K.) **Principal decays of softwoods used in Great Britain.**—106 pp., 16 pl., 5 figs., London, H.M. Stationery Office, 1938 [issued 1939]. 2*s.* 6*d.*

Descriptions are given of the gross and cultural characters, economic importance, and control of the principal fungal rots of standing and felled conifer wood in Great Britain, together with keys for the identification of the chief forms of decay and of cultures of fungi commonly found on coniferous timber. The fungi dealt with include *Armillaria mellea*, *Fomes annosus*, *F. pinicola* [*R.A.M.*, xviii, p. 144], *Polyporus schweinitzii*, *Stereum sanguinolentum*, *Trametes* [*F.*] *pini*, *F. officinalis*, *F. demidoffii*, and *P. sulphureus*, all causing rots of standing conifers; *Peniophora gigantea* [ibid., xvi, p. 429] *Polystictus abietinus*, *Lentinus lepideus*, *Lenzites sepiaria*, *L. abietina*, white species of *Polyporus* (*Leptoporus* section), and *T. serialis*, causing rots of felled softwoods and softwoods in service in the open; the following minor rots of felled softwoods: *Lenzites trabea*, *F. roseus* [ibid., xvii, p. 363], *T. carnea*, *Polyporus benzoinus* [ibid., xviii, p. 215] and *P. borealis*; and the follow-

ing decays of softwoods in buildings: *Merulius lacrymans*, *Poria vaillantii* [ibid., xviii, p. 285], *Coniophora cerebella* [*C. puteana*], *Paxillus panuoides*, and *Poria xantha*. The work concludes with notes on different types of staining, and there is a comprehensive bibliography.

Goidànich (G.), Borzini (G.), Mezzetti (A.), & Vivani (W.). **Ricerche sulle alterazioni e sulla conservazione della pasta di legno destinata alla fabbricazione della carta eseguite nella R. Stazione di Patologia Vegetale di Roma.** [Researches on the staining and preservation of wood pulp destined for paper-making carried out at the Royal Station of Plant Pathology, Rome.]—513 pp., 3 col. pl., 105 figs., 31 graphs, 1 map, Rome, Tipografia del Senato del Dott. G. Bardi, 1938. [French, English, and German summaries]. 50 lire.

In this exhaustive treatise the authors describe in detail a comprehensive series of investigations carried out in Italy under the auspices of the Ente Nazionale per la Cellulosa e per la Carta into the staining of stored wood pulp destined for paper-making [cf. *R.A.M.*, xviii, p. 220].

The introduction and Chapter I (by Goidànich) discuss the general scope of the problem, earlier work in various countries, and the production of wood pulp (mainly from poplar) in Italy. Chapter II, describing the fungi isolated, is reprinted from Goidànich's earlier paper [ibid., xvii, p. 558]. The third chapter (by Mezzetti) deals with the bacteria found, the staining ability of which was much below that of the fungi.

Chapter IV (by Goidànich and Vivani) describes 33 different types of staining observed, arranged in order of injuriousness, together with the staining abilities of the fungi concerned. A list is given of 38 staining fungi arranged also in order of their injuriousness, the most harmful being *Haplosporella vivanii* and *Phialospora richardsiae* followed by *Hormodendrum elatum*, *H. chamaeleon*, *Stachybotrys alternans*, and *Alternaria tenuis*. The stains produced in nature differed from those developed as a result of artificial inoculations, largely because under natural conditions several different fungi mutually affecting one another are generally concerned in the staining, and also because the environmental factors are very different under the two sets of conditions. The microscopic characters of the stains were not of great value in identifying the organisms responsible. A study of the ability of ten fungi to modify the physical and physico-mechanical properties of the pulp showed that the most injurious in this respect was *P. richardsiae* followed by *Fusarium sambucinum*, and then by sterile fungus no. 193.

Chapter V (by Goidànich and Vivani) describes the physiological and biological characters of the fungi. The effect of heat was determined on the growth of 19 fungi in culture, and the data obtained showed that under the climatic conditions prevailing in Italy, the temperature existing in all but the superficial layers of wood pulp is invariably found favourable to fungal growth. In tests with ten fungi on wood pulp containing from 100 to 400 per cent. moisture a slight diminution of growth was observed at the extremes only. From studies on the effect on fungal growth of the chief nutrient material present in wood pulp, it would appear that destruction of cellulose by staining

fungi is, as a rule, unimportant. The sugars most favourable to fungal growth were glucose, levulose, and maltose. Of the nitrogenous materials present, sodium nitrate was most, and ammonium nitrate least, favourable to fungal growth. Tannins appeared to have an adverse effect on the fungi only when present in unusually large quantities; their presence appeared to make the staining darker and more conspicuous. Other experiments showed that an acid reaction in the pulp, if not too marked, favours fungal growth. Examination of the effect of environmental factors on staining ability demonstrated that heat was directly responsible for bringing about certain staining effects, humidity and availability of air favoured oxidation and the spreading ability of the pigments, changes in the P_H value of the pulp caused marked changes in the colour of the staining, and pigment formation was markedly affected by the chemical composition of the pulp.

In Chapter VI, Goidànich, Mezzetti, and Vivani deal with the etiology and epidemiology of the staining. It was established that when the pulp emerges from the machines it contains few or no fungi, that fungi are abundantly present in the air, but are seldom found in clean water; during processing, however, the pulp becomes progressively more infected, owing to the deposition of spores from the air, and the filtering effect of the pulp during drying [cf. ibid., xvi, p. 575]. Yeasts and bacteria are abundantly present in the pulp when it emerges from the machines, the chief source of these organisms being the wood; they are only sparsely present in the air and in clean water. The quantities of bacteria and yeasts present in the pulp vary widely during the different processes. Bleaching the pulp with sodium bisulphite increases susceptibility to attack by staining fungi, though the effect of the chemical is initially unfavourable to them.

Chapter VII (by Borzini) describes the effect of a large number of antiseptics on the growth of the staining organisms in culture, and Chapter VIII (by Borzini and Vivani) describes practical trials carried out in paper mills with the most promising of these materials. After seven months' storage the best results were given by borax (in the proportion of at least 1 per cent. by weight of the fresh pulp), sodium fluoride (0·5 per cent.), and zinc chloride (0·9 per cent.). Salicylic acid increased the staining.

In the final chapter Goidànich indicates the ways in which the results obtained may be of service to the industry in Italy. [A note on this work appears in *Boll. Sez. ital. Soc. int. Microbiol.*, x, 9, pp. 196–198, 1938.]

Cause and prevention of blue stain in wood.—*Tech. Notes For. Prod. Lab., Wis.*, 225, 4 pp., 1938. [Mimeographed.]

The occurrence of blue stain [*R.A.M.*, xvii, p. 150] in hardwood logs can be effectively retarded for storage periods of up to three months (in the absence of heavy insect infestation) by spraying the ends and barked areas of the freshly cut logs with a 5 per cent. solution of dowicide H [ibid., xvi, p. 579] (sodium tetrachlorophenolate plus excess alkali), santobrite, or dowicide G (both being sodium pentachlorophenolate plus excess alkali), or a 2 per cent. solution of lignasan (ethyl mercuric chloride plus inerts) [ibid., xvii, p. 150]. The same treatments

are suitable also for softwood logs, though the protection given may be of shorter duration.

The most effective means of preventing blue stain in lumber is to kiln-dry the stock when green from the saw. Stock requiring to be air-seasoned can be protected by treating the surfaces with a fungicide or by using a piling method (such as end-racking or crib-piling) that results in a rapid drying; the former method is the cheaper and more effective. The chemical treatment of lumber to prevent staining during air-seasoning usually consists in dipping in dowicide G, dowicide P (sodium tetrachlorophenolate+sodium 2-chloro-o-phenylphenolate+excess alkali), lignasan, and santobrite (all effective for both softwoods and hardwoods), dowicide H (used chiefly with hardwoods), or soda (sodium carbonate and sodium bicarbonate singly or mixed), this last material being used for softwoods at a rate of at least 60 lb. per 100 galls. water at about 160° F. To secure satisfactory results with any dipping or spraying treatment the logs must be free from stain at the time of treatment, no delay must occur between sawing and treatment, and coverage must be thorough.

Wood preservatives.—12 pp., Madison, Wis., U.S., Dep. Agric., For. Prod. Lab., 1938. [Mimeographed.]

Notes are given on a number of wood preservatives widely used in the United States [*R.A.M.*, xvii, p. 641].

Testing wood preservatives.—12 pp., Madison, Wis., U.S. Dep. Agric., For. Prod. Lab., 1938. [Mimeographed.]

In the preliminary section of this paper it is pointed out that there are at present no laboratory tests by which the relative effectiveness of different wood preservatives [see preceding abstract] can be determined with complete reliability. The qualities required in a good timber preservative are discussed, and it is shown how a great deal of useful information can be obtained by laboratory tests on toxicity, penetrating properties, corrosiveness, painting properties, colour, odour, fire resistance, fire and explosion hazard, water repellence and swelling, volatility, leachability, and chemical stability.

Tompkins (C. M.), Gardner (M. W.), & Thomas (H. R.). **Black ring, a virus disease of Cabbage and other crucifers.**—*J. agric. Res.*, lvii, 12, pp. 929–943, 6 figs., 1938 [issued February, 1939].

A condensed version of this paper has already been noticed from another source [*R.A.M.*, xvii, p. 151].

Dalgliesh (C. S.). **Brown-heart in Swedes. Trials with application of borax.**—*N.Z.J. Agric.*, lvii, 6, pp. 511–513, 3 figs., 1938.

During 1937 further trials in the control of brown heart of swedes were conducted in New Zealand [*R.A.M.*, xvi, pp. 82, 360, 649; xvii, p. 152], in which borax at the rate of 10, 15, 20, and 30 lb. per acre was broadcast on the land previous to sowing. Complete control of brown heart was secured with 10 lb. per acre, but no harmful effects on seed germination were produced by applications of 30 lb. per acre, all treated areas showing fresher foliage than the untreated. An applica-

tion of 15 lb. borax per acre gave an average increased yield of 5½ tons. The broadcasting of borax before sowing, taking care that the seed does not come into close contact with the borax, is considered a safe method of control of brown heart, whereas dressings of lime immediately before sowing or the use of fertilizer mixtures containing borax and free lime are not recommended, the first being incompatible with brown heart control, and the second having harmful effects on seed germination. The mixing of borax at the rate of 8 lb. per acre with 2 cwt. of fertilizer applied to the land a few days before sowing, the seed being sown with 1 cwt. or more of fertilizer, is described as a successful measure, which has been adopted as a farming practice in the Rotorua-Putaruru district with good results.

Böning (K.). **Die wichtigsten Krankheiten und Schädlinge des Meerrettichs.** [The most important diseases and pests of Horse-radish.]—*Nachr. SchädlBekämpf., Leverkusen*, xiii, 2, pp. 62–87, 27 figs., 1938. [English, French, and Spanish summaries on pp. 94–95, 97, and 99–100.]

In addition to the horse-radish diseases in Germany discussed in the author's previous paper [*R.A.M.*, xvi, p. 360], notes are given on the relatively unimportant foliar disorders caused by *Alternaria brassicae*, *Ramularia armoraciae* [ibid., iv, pp. 191, 397], *Septoria armoraciae*, *Phyllosticta brassicae* [*Phoma lingam*: ibid., iv, p. 210; vii, p. 71], *Ascochyta rusticana* Bub. & Kab., *Botrytis cinerea*, *Erysiphe polygoni*, and mosaic [ibid., xiv, p. 731].

Böning (K.). **Fragen der Anbautechnik und Krankheitsbekämpfung im Meerrettichbau.** [Questions of cultivation technique and disease control in Horse-radish growing.]—*Prakt. Bl. Pflanzenb.* xvi, 9–10, pp. 205–233, 12 figs., 1938.

This further study on horse-radish cultivation in Germany [see preceding abstract] deals with such matters as judicious spacing, times of sowing, and methods of propagation in relation to productivity, and describes the reaction to white rust [white blister: *Cystopus candidus*] and root blackening (*Verticillium armoraciae*) [cf. *R.A.M.*, xvii, p. 10] of some standard varieties tested in different localities. In tests from 1932 to 1935, inclusive, the three chief German sorts, Bavarian, Silesian, and Spreewald, were all highly susceptible to *C. candidus*, whereas considerable resistance was shown by the Hungarian 'sharp' and 'sweet', especially the former, while the Austrian, though heavily attacked, did not succumb to infection as readily as the externally similar Spreewald. In 1937 the Bavarian, Spreewald, Silesian, and Austrian varieties developed, respectively, 30, 59, 47, and 17 per cent. root blackening, the corresponding figure for Hungarian 'sharp' being only 6 per cent.

Chrzanowski (A.). **Fighting Cercospora beticola Sacc. with Bordeaux mixture.**—*Gaz. cukrown.*, lxxxii, pp. 329–335, 385–390, 1938. [Polish. Abs. in *Chem. Abstr.*, xxxiii, 4, p. 1434, 1939.]

The timely application of Bordeaux mixture as a preventive of beet leaf spot (*Cercospora beticola*) in the Warsaw district of Poland increased

the mean root and leaf weights from 324 and 127 to 436 and 337 gm., respectively, and the sugar content from 16·9 to 19·31 per cent., the corresponding figures for late treatments being 366 and 217 gm. and 18·5 per cent., respectively.

WALKER (J. C.), JOLIVETTE (J. P.), & MCLEAN (J. G.). **Internal black spot of canning Beets and its control.**—*Canning Age*, xix, 13, pp. 489–491, 508, 3 figs., 1938.

A detailed, tabulated account is given of experiments at Winneconne, Wisconsin, in 1938 in the control of internal black spot of Detroit Dark Red and Good-for-all garden beets by borax, from which it appears that a dose of 40 lb. per acre will give reasonably good results in most cases, though in certain areas it may be necessary to increase the amount to 60 lb. The disease, which is stated to be causing much damage among canning beets in New York, Michigan, and Oregon, besides Wisconsin, is characterized by the presence between the rings in the thin-walled layers of the root of irregularly sized and shaped, hard or corky, black spots [*R.A.M.*, xvii, p. 718], usually accompanied by foliar distortion (unilateral development, abnormal elongation, and in extreme cases rosetting) and intense reddening. Occasionally either the root or leaf symptoms occur independently, but they are usually closely correlated.

PERSON (L. H.) & EDGERTON (C. W.). **Seed treatment for the control of bacterial blight of Beans.**—Abs. in *Phytopathology*, xxix, 1, p. 19, 1939.

At no time during the past 25 years of testing seed disinfectants [? in Louisiana] for the control of bacterial blight of beans [*Phaseolus vulgaris*] caused by *Bacterium phaseoli* [*R.A.M.*, xv, p. 782] and *Bact. medicaginis* var. *phaseolicola* [ibid., xvi, pp. 85, 151; xvii, p. 720] did dusts prove satisfactory for this purpose, but in the spring of 1938 very favourable results were obtained by 12 to 14 minutes' immersion in a solution of 1 to 500 mercuric chloride in 70 per cent. ethyl alcohol+2 per cent. acetic acid. Effective control of initial infection on the primary leaves was secured in all three plantings from 7 to 15 seed lots, whereas the untreated material gave rise to numerous severe infection centres. Some reduction of germination is caused by the treatment.

PARRIS (G. K.). **The reactions of introduced Bean varieties to rust (Uromyces phaseoli typica) in Hawaii.**—*Plant Dis. Reptr*, xxii, 21, pp. 424–428, 1938. [Mimeographed.]

Bean [*Phaseolus vulgaris*] rust (*Uromyces phaseoli typica*) [*U. appendiculatus*: *R.A.M.*, xvii, p. 427], first reported from Hawaii in 1918 by C. W. Carpenter, occurred in a severe form in December, 1937, on the widely grown Lualualei variety, rapidly spreading from the original focus of infection on Oahu throughout the Territory. The results of inoculation experiments with uredospore suspensions of the fungus on 41 reputedly resistant horticultural varieties imported from the United States presented so many inconsistencies as to indicate the existence in Hawaii of a race of the rust distinct from races 1 and 2.

Felix (E. L.). **Early planting, an aid in the control of Onion smut.**—Abs. in *Phytopathology*, xxix, 1, p. 6, 1939.

Early sowing (20th March to 5th April under normal weather conditions) is stated to have effected an appreciable reduction in the incidence of onion smut [*Urocystis cepulae*: *R.A.M.*, xix, p. 82] in the Elba district of New York State. The minimum soil temperatures for onion seed germination and smut growth and infection are about 8° and 10° C., respectively. Prevailing soil temperatures of 8° to 13° during the pre-emergence phase substantially lower the amount of smut, while a maximum of 8° to 10° in the top inch of soil reduces greenhouse and field infection to between 60 and 78 per cent. of that occurring at the optimum of 15° to 20°. Very early planting is recommended as a supplement to the regular formaldehyde treatment, especially in fields with a relatively small amount of infection.

Ivanoff (S. S.). **White rust of Spinach.**—Abs. in *Phytopathology*, xxix, 1, p. 12, 1939.

Heavy losses were caused in southern Texas in 1937–8 by an epidemic of white rust (? *Albugo* [*Cystopus*] *occidentalis*) of spinach, which broke out in December and continued throughout the growing season, leaving no healthy plants in the fields inspected. Symptoms of the disease include the development of scattered white sori mainly on the under sides of the leaves and, under certain conditions, a yellowing and mottling of the foliage. The fungus forms hyaline conidia and in the diseased tissues a profusion of pale to dark brown oospores, with a finely and shallowly reticulate surface, appearing pitted. These organs seem to be identical with those of the white rust attacking *Chenopodium capitatum*. None of the 150 spinach varieties and strains tested for their reaction to *Cystopus occidentalis* proved to be immune, but some degree of resistance was shown in commercial fields by Viroflay in comparison with the widely grown susceptible Bloomsdale Longstanding.

Selariès [P.] & Rohmer [G.]. **La septoriose du Céleri en Alsace.** [Septoriosis of Celeriac in Alsace.]—*Ann. Épiphyt.*, N.S., iv, 3, pp. 485–493, 1 fig., 1938.

Details are given of the authors' study of the control of the celeriac leaf blight (*Septoria apii-graveolentis*) [*R.A.M.*, xviii, p. 291] which is stated to be so prevalent in Alsace as to compromise the cultivation of the crop in that region. Satisfactory disinfection of the seed, with the least injury to its germinability, was obtained by steeping the seed for 30 minutes in 2 per cent. commercial formalin. The seed-beds should be disinfected by watering them with 10 l. of 5 per cent. formalin per sq. m., after which the soil is covered with bags for 48 hours; the surface of the soil is then raked superficially on four or five consecutive days, when it is ready for sowing. It is recommended that the seedlings be sprayed with 1 per cent. Bordeaux mixture at least twice before transplanting. In practice good control of the disease in the field was obtained by spraying the seedlings with 1 per cent. Bordeaux mixture as soon as the first pustules of the blight appeared, followed by a second application of the spray two or three weeks later.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 1, pp. 25–29, 4 figs., 1939.

The measures recommended for the control of anthracnose of cucurbits (*Colletotrichum lagenarium*) [*R.A.M.*, xvii, p. 789] in New South Wales are as follows. Crop rotation should be adopted, and cucurbits grown on the same land only once every three or four years. All diseased material should be burned. Seed must be taken from a clean crop, or treated for five to ten minutes in mercuric chloride (1 in 1,000). Affected vines should not be disturbed while wet. Spray applications of Bordeaux mixture (3–4–40) should be made when the first two or three leaves have developed, shortly after the vines have begun to run, about a week after the first melons have set, and lastly two or three weeks later.

Cook (H. T.) & Nugent (T. J.). **Fusarium wilt resistant Watermelons.**—*Trans. Peninsula hort. Soc.*, xxviii, 5, pp. 30–38, 2 figs., 1938.

In greenhouse soil inoculation experiments at the Virginia Agricultural Experiment Station in 1938, the Hawkesbury watermelon showed a considerable degree of resistance to wilt (*Fusarium*) [*bulbigenum* var. *niveum*: *R.A.M.*, xviii, p. 84] (9·9 to 22·6 per cent. wilted seedlings compared with 52·2, 81·8, and 74·3 per cent. in the Leesburg, Owens Grey, and Tom Watson varieties, respectively). Hawkesbury also gave very satisfactory results in the field, and most of the 18 growers supplied with seed of this variety expressed a favourable opinion of its qualities.

Uppal (B. N.), Patel (M. K.), & Kamat (M. N.). **Bacterial leaf-spot of Soybean in Bombay.**—*J. Univ. Bombay*, vi, 5, pp. 16–18, 1938.

An organism isolated from a leaf spot of soy-bean on the Jalgaon Farm, Bombay, in 1934 is identified on the basis of its morphological and cultural characters as *Phytomonas* [*Bacterium*] *phaseoli* var. *sojense* [*R.A.M.*, xvi, pp. 585, 655].

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, x, 8, pp. 253–256, 1938.

Latvia. Lists are given (30th April, 1938) of (*a*) pests and diseases to be combated in, and as far as possible excluded from, Latvian tree nurseries, and (*b*) dangerous diseases (30 in number including many well-known pathogens) and pests and plants prohibited from importation into the country.

Service and regulatory announcements. July–September, 1938.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, pp. 88–118, 1938.

Summaries are given of the plant quarantine import restrictions in force in New Zealand (supplementary), French zone of Morocco (revised), Turkey (supplementary), Italy (supplementary), Australia, Colombia (superseding previous regulations), Malaya (superseding previous regulations), and Kenya.